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An Interstate Labor Commission.

WHEN a railway decides that it is necessary to increase transportation rates in a certain district, or when it refuses for cause to reduce a rate held by shippers to be too high, the parties concerned immediately resort to the powers of the Interstate Commerce Commission which customarily issues a restraining order in the first case and deliberates for considerable periods in either case. The transportation company is unable to act until the Commission places its O. K. on the prospective action. The power of the Commission is absolute for the reason that it is governing the movements of an organization in every way responsible to the public. The success of the whole idea is hardly questionable and it rests on the solid basis of absolute power.

The railway world, and indeed the whole industrial world, is now confronted with the organizaton of labor trusts which are not responsible to the law, to its employers or to the public while they hold in their hands the power to disrupt all of the structures of the public. At present the management of a large railway system is confronted with the problem of acceding to the demands of its labor organizations or of allowing a continuance of a strike, the results of which will seriously affect the interests of the public. While the strike is not primarily one called for the purpose of forcing the payment of increased wages, it eventually means just that. A fight for the recognition of a federation is a fight for higher wages either in money or money value.

We then are "up against" this proposition. A railway *cannot* increase its own wages (rates) except with the freely obtained consent of its employers (the public). Railway employees *can* force an increase of wages for themselves by unrestricted combination without justice and without any freely given consent on the part of their employers, the railway managements. The situation is manifestly unfair and the public is the eventual victim of the unfairness.

A suggestion comes from Wm. White, president of the National Boiler Washing Co., recommending an Interstate Labor Commission organized on the plan of the present Interstate Commerce Commission for the purpose of governing the labor "trust" much as the commerce "trusts" are now governed. The difficulty at once apparent in an attempted regulation of strikes and other features incidental to organized labor is the irresponsibility of the representatives of labor. It would appear however, that the plan would be feasible if worked out somewhat along the following lines:

Endow a commission with power to supervise all labor organizations employed by corporations engaged in interstate business and to arbitrate all differences with respect to wages and conditions in the same manner as the wages of the railways (rates) are now arbitrated. In order to do this, make it compulsory for all members of the labor trust to sign bonds making the individual responsible to the law and forcing him to obey the mandates of the commission. This would not be unconstitutional because the individual would still be able to work and earn a living as an individual unbonded. As soon, however, as he joins a union he becomes part of a trust formed for the restriction of trade and his bond makes him responsible to the commission.

The result would be the open shop or the legally controlled organization and strikes would be impossible.

Everybody admits that there is something seriously wrong with the present government of labor and that the public is liable to suffer, at any time, greater injury than it ever suffered from the railway rebate evil, and the ungoverned fixing of rates by the transportation companies.

The plan is given in the merest outline with the firm conviction that it is right and, in practice, will be a means solving one phase of a dangerous and irritating question. Much thought, on the part of those competent to handle the drafting of the necessary legislation, must be given to detail before the plan could be worked out.

Merit.

THE SUBSCRIBERS TO a trade paper should not overlook the fact that the advertising pages are of great educational value. The materials which are exploited in *consecutive issues* of an established and reliable trade journal must show merit in order to attract the attention and withstand the keen criticism of the technical and practical man, and the merit claimed must be backed up by service in order to obtain or retain the confidence of the article.

Herein lies a great incentive to the manufacturers to "produce" materials which will promote efficiency and economy; a sustained attempt to exploit articles of little merit in a trade journal cannot but result in loss, since the subscribers are limited to a certain field. Such may not always be the case where millions of people are reached by enormous circulation and success does not depend on repeat orders. Success for the manufacturers in this field, then, depends on value given and not on extravagant promises, or the appeal of beauty or novelty. It follows that the successful trade journal advertiser takes advantage of all available practical and technical knowledge, and then adds to it originality or inventive genius to produce those materials which will stand up under test. Thus the readers of a technical journal in a special field exert a great influence on the advertiser, which compels him at every opportunity to increase the merit of his goods.

The educational value of the advertising pages of a trade paper should be overlooked by none, and they should be and are read with the idea that the claims put forth must be substantial or the life of the advertising concern must be short. This reasoning applies especially if the field of the journal is limited to men of a special class, in other words, if the class of subscribers catered to is *specific* and not *general;* for then must every advertisement concern material in which practically every subscriber is interested.

Spasmodic appearances of an ad will not show the results that consecutive appearances produce. It is but natural to think that the discontinuance of an ad after a few insertions means financial inability, which will probably be charged to a lack of merit, though this idea may in many cases be entirely wrong.

EDUCATING EMPLOYES, CHICAGO GREAT WESTERN.

General Manager Hiram J. Slifer, of the Chicago Great Western, recently made a three weeks' educational tour of his system, during which time every employe of the Chicago Great Western, in every department, has been accorded an opportunity to come in personal contact with the general manager, grasp him by the hand and understand more fully than before the exact relationship between employer and employe, so far as this corporation is concerned.

Two lectures to crowded houses at the Metropolitan Hall, 44th avenue and Harrison street, Chicago, on October 14th, were the culmination of a well planned tour through the states of Illinois, Iowa, Minnesota, Missouri and Kansas. During the three weeks every station on the line was visited and stops were made at every division point, terminal and important station, where by prearranged plan employes congregated to listen to the brotherly talk of their popular chief. General Manager Slifer in his talks made clear the fact that he was not to be considered as an employer, but rather as an employe and co-worker with those whose privilege it was his to address. He thoroughly explained the exact relationship of wage earners to the financial interests controlling the road, showing wherein the wage claim was the first and foremost in the disbursement of money. He then explained the relationship of railroads to the public, the requirement of state and federal laws and the requirements of city ordinances as regards the emission of black smoke from locomotives.

In explaining the extraordinary expenses imposed upon railroads during the past few years by these requirements, and the veto of the Interstate Commerce Commission in the rate question, it was his endeavor to show the employes their duty in the way of helping the railroad company bear the constantly increasing financial burden. While in the main he endeavored to show where saving might be effected by the individual employe by the conservation of supplies, he gave them many practical illustrations for lending a hand in the course of their daily duties. For instance, the freight claim question was discussed at considerable length and employes were shown wherein by a little care and judgment many a claim may be avoided. Trainmen were cautioned in regard to rough handling of equipment, truckmen and checkers were shown how they could assist in avoiding claims. The question of fuel economy was not overlooked, and many practical points were given, not only to enginemen, but to others who might assist in an indirect manner in helping to solve the question of black smoke. Bridge and section men were shown how they could be of service in avoiding expense by care and discretion in their routine work. Enginemen were shown how easy it is to cause extra expense by damage to equipment, through accident or carelessness, and how easy it is to avoid such expense. Particularly did he caution freight crews to look out for the poor car repairer working at a disadvantage and in a hazardous position underneath the car, saying that they should respect the blue flag whenever seen, place no obstruction before it, not even standing in front of it.

In many ways did he show how expense could be avoided and how money could be saved to be used in payment of wages, improving equipment and providing additional safeguards for the prevention of loss of life or limb. Even office employes were given some useful hints as to what they might do to save their "penny a day," which is the maximum demanded of any one, Mr. Slifer realizing that if an earnest effort is made by every employe to save a penny a day a habit will be formed which will result in a far greater saving. Even at the rate of a penny a day, the saving by the 9,000 employes of the Chicago Great Western would be $32,850 a year.

This educational tour, thorough and complete as it was, well timed and well arranged, and taken by the employes in such a kindly spirit of co-operation, cannot fail to have a lasting effect upon the working methods of the Chicago Great Western, with the consequent result of favorable showing in the expense accounts of the company.

Galesburg Tie Treating Plant, C., B. & Q. R. R.

The Galesburg tie treating plant was put in operation December, 1907. The plant was designed and constructed under the supervision of F. J. Angier, at that time superintendent of timber preservation on the Chicago, Burlington & Quincy R. R., now superintendent of timber preservation on the Baltimore & Ohio R. R.

Under his supervision a high standard of cleanliness was established in the plant, and this policy has been efficiently followed out and, if possible, improved under the supervision of J. H. Waterman, who succeeded to the position of superintendent of timber preservation. Although thousands of gallons of creosote oil are used, there are only two or three places in the plant where creosote can be seen, and these are in small drip pans at the ends of the treating cylinders. No oil or emulsion is allowed to drip or run onto the floor. Bands from a picnic ground nearby, when driven in by rain, are often invited to make use of the plant, and spread their lunches on benches or on the floor around and under the treating cylinders.

The entire plant is of concrete construction, which is probably the easiest kind of factory construction to keep clean and sanitary. The area covered by the tie yard and treating plant is about 4,500 x 800 ft.

Galesburg Tie Treating Plant and Storage Tanks, C. B. & Q. R. R.

The tie yard has four tracks, each about 4,000 ft. long. These tracks are used when unloading cars and loading trams. The ties are usually delivered to the yard in box cars Operations are carried on from only two tracks at one time. For instance, when loading ties to be treated, the trams are spotted on track 4 and this track is worked on until all the ties have been loaded and sent to the plant. In the meantime, all unloading is done off one of the other tracks, say track 3, until the piles along this track have been filled. This system prevents confusion and gives a system whereby the length of time of seasoning is more easily kept. The tracks are connected to a switching lead at each end, so that cars are easily handled by one switch engine, which is constantly in attendance.

One man is kept at work constantly, cleaning up pieces of timber about the tie yard and plant. A small narrow gage car drawn by a team of horses is used to gather up this material and remove it from the vicinity of sound timber.

It is impractical to handle timber and expect to get good results from treating unless it has been thoroughly seasoned. The best way to pile ties for seasoning is to make them up in piles known as one to eight. Piling at the plant is made up into piles with two bearings only. There is difficulty in getting the piles level with three bearings. With two bearings there is very little trouble, and even if the bearings are not level the timbers will not warp or twist in the piles. The piles are made square with good thick stripping between each tier, and the strip should come directly over the bearing. The piles are made 20 high. This may appear expensive, but it is not with a good modern crane. The average cost is 5 cents per stick.

For piling lumber a pile with two bearings only is used, as this avoids springing the timber if the bearings settle unevenly, or if they are not placed in true level as they should be. Another advantage of this kind of pile is that it takes less strips with two bearings than three. In piling timber one end should always be kept plumb and straight, and the strips should be directly over the bearing or foundation. If this is not done the timbers are apt to warp and twist. Of course timber forty, fifty or sixty feet long should have more than two bearings. A two-bearing pile refers to what might be termed standard lengths, from twelve to twenty-four feet. Aside from seeing that the timbers are stripped properly between every tier, every piece should be separated from a half to one inch. This will give the air a chance to circulate through the pile and the timbers will season without mildewing or becoming otherwise injured.

Switch ties would come under the class of timber, and a great deal of pains should be taken in stripping and separating each stick.

Ties and piling are frequently seen which are absolutely worthless and ought not to be treated, some of which have been cut only a few months, simply because it was not properly cared for and properly piled to season.

In the South there are long wet seasons in April, May and June, and if timber is cut in those months and left to lay in the woods or hauled on the right-of-way of a railroad or on the bank of a river and thrown in solid piles, it is a fact that oft-times in less than two months the sap will sour, the fungi will start to grow, and the timber, whether it is

timber, piling, ties or lumber, is worthless for treatment.

There is good reason to believe that there is more timber destroyed and become absolutely worthless because it was not properly cared for after it was cut, in other words, because it was not properly piled, than is destroyed in any other way; and most of the timber which becomes sap rotten and full of fungi, so that it is worthless, gets in this condition because there is not enough care taken in piling after the timber has been cut in the woods.

Method of Piling Ties for Seasoning, Galesburg Plant.

The tie piles in the yard are very accurately laid out and stakes are set showing the correct spacing for the tie stringers. Treated cull ties are being used exclusively as stringers; thus no muddy or wet ties need ever be put through the cylinders, and in the winter there is no trouble occasioned by trying to pry an untreated frozen tie out of the ground. The treated tie stringers after being properly placed are left there as long as they remain serviceable.

Ties are unloaded when received and piled up without sorting. When a string of cars is spotted by the engine, the cars are usually left until unloaded. If an attempt were made to sort ties when unloading, there would be an endless amount of switching. Ties are loaded from the piles directly onto the trams ready to enter the treating cylinders. Each tram holds about forty ties. When loading, it is very easy to sort the ties ,as the trams may be easily moved from pile to pile by hand, if necessary.

The tie trams are not provided with couplings; they are moved by shoving ahead of the engine; the trams do not come in contact when being pushed along, the push being received by the loaded ties; they run on a narrow gage track, made by placing a third rail between the two standard gage rails. After being loaded, the ties are locked down by semi-circular steel hoops, which clamp into pockets on the sides of the trams. These hoops are pivoted on the side of the car opposite the lock, and the hoops are thrown over out of the way when loading. Ties are handled three times only from time received in the yard until shipped out, as follows: unloaded from cars and piled; loaded on trams and treated; loaded into cars and shipped.

Some two or three hundred feet from the treating plant there is a cable house in which a drum operates to wind up a steel cable which is used to propel trains into and out of the treating cylinders. The cable is fastened to the last car of the train of trams, and when the cable is wound up the last car pushes the other cars ahead into or out of the cylinders.

It is the general policy not to treat ties until they have been air seasoned for at least six months, and eight months is preferred. If ties have not been seasoned that long or there is any reason to believe that they are not thoroughly seasoned, they are steam seasoned for 3 or 4 hours. The management considers that air seasoning produces stronger timber than steam seasoning.

The kinds of timber treated, or which have been treated, are red oak, beech, hickory, hemlock, tamarack, hard maple, ash, sweet gum, sycamore, poplar, douglas fir, elm, shortleaf pine, lodgepole pine, bull pine, soft maple, tupelo gum, birch, cottonwood and cypress. All ties have the bark removed when received at the plant. About 75 per cent of the ties now being treated are red oaks due to the excellent results which have been obtained from this wood when properly treated.

The treatment used mostly at the plant is the Card process, although the equipment allows with equal facility treatment either with straight creosote, or straight zinc chloride. The Card process is patented by J. B. Card and requires: (1) Timber to be thoroughly air seasoned; (2) vacuum of from 22 to 26 inches to be maintained for one hour; (3) emulsion to be admitted at not less than 180 degrees, the pressure being run up to and maintained at 125 lbs. per square inch for three or four hours; (4) ties to be subjected to a final vacuum to dry them off.

The preservative used in the Card process is an emulsion consisting of zinc chloride and creosote oil. The zinc chloride is first dissolved in water, and then the oil is added.

There are three treating cylinders in the plant, each 132 feet long and 6 feet 2 inches in diameter, with a capacity of 700 ties. At one end of each cylinder is a heavy steel swing door,. on the lower part of which is a wheel which runs on a circular track, to support the door when it is opened and relieve the hinge of the heavy weight. The treating cylinders or retorts are made of 7/8-in. steel, and in testing, these cylinders withstood a pressure of 350 lbs.

All doors are bolt locked and can be made air tight. A capacity train of loaded tie trams is placed in the cylinder and the openings are all closed air tight, after which the vacuum is set up. After the vacuum has been on for a certain time, or until the pressure has been reduced to a proper amount, the emulsion is admitted until the tank is completely filled. The exact amount of emulsion that should be forced into the tie is determined by the table shown below. These results were deduced by Mr. F. J. Angier after extensive tests:

Classification of Tie Timbers.

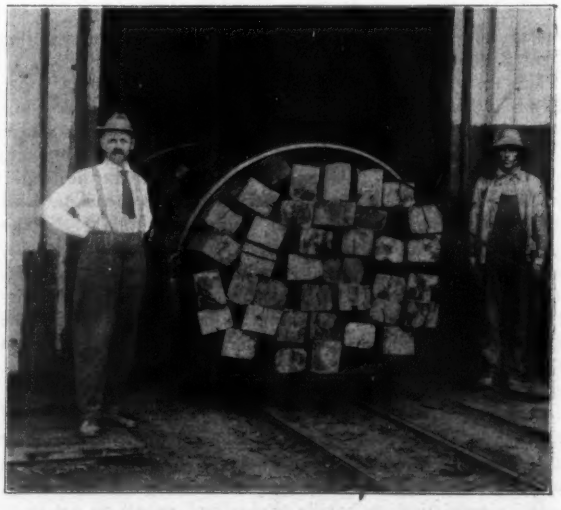
By Per cent in Volume Absorbed.

(Timber to be Air Seasoned 6 Months or More.)

Less than 22% absorbed = Class "A".

23% to 30% = Class "B".

More than 30% = Class "C".



Tie Trams at Entrance to Treating Cylinders.

Classification of Tie Timbers.
(Continued.)

Class "A"	Class "B"	Class "C"
	Hardwood.	
All Oaks	Hard Maple	Elm
Hickory	Ash	
Beech		
	Softwood.	
Hemlock	Sweet Gum	Shortleaf Pine
Tamarack	Sycamore	Lodgepole Pine
	Poplar	Bull Pine
	Douglas Fir	Soft Maple
		Tupelo Gum
		Birch
		Cottonwood
		Cypress

Strength of Solution Used for Card Process.

5——23	4——19	3——15

The figures given in the lower part of the columns refer to amounts of zinc chloride and creosote to be used. For instance in the first column it is specifiid that the zinc chloride should be a 5 per cent solution or in other words 5 parts of dry zinc chloride is to be dissolved in 95 parts water. The creosote is then mixed with the zinc chloride in the proportion 23 per cent creosote (as shown in table) and 67 per cent of the zinc chloride solution.

The kinds of timber are separated for treatment into classes A, B and C are shown in the above table. Knowing the cubical feet of wood in the cylinder, a simple computation of 23 per cent (for class "A") of this cubical volume will give the cubic feet of preservative which should be forced in the tank under pressure in order to completely impregnate the wood. In the same manner the proper amount of emulsion to be used for class B or C can be determined. The pressure pumps are turned on, taking emulsion from a measuring tank. The pumps are kept going until the required amount of emulsion, as computed, has been pumped into the cylinder and hence into the charge. Following this method means that no two charges are nor should they be, treated exactly alike, and the time required to inject the emulsion may vary from 7 to 14 hours. Although the time required is not uniform, the results are that a practically uniform amount of preservative is forced into every cubic foot of timber.

In order to keep the chloride of zinc and the creosote oil thoroughly mixed during the process of treatment it is agitated in the tanks by forcing air through pipes into the liquid. Compressed air is furnished for this purpose by an Ingersoll Rand compressor. The liquid in the treating cylinder is continually agitated during treatment by a centrifugal pump operated by a Western Electric motor. This pump draws the liquid from top of the cylinder through the circulating or agitating pipe and returns it again through a pipe in the bottom of the cylinder. The circulating pipe at the top connects with the cylinder at three places, one connection at either end and one in the middle; the pipe returning the oil to the cylinder lies along the entire bottom of the cylinder, and is perforated throughout its length. The agitation of the liquid is wherein the Cord process differs from any other. The emulsion being an oil and a solution containing much water, it is necessary to keep it constantly stirred up to prevent the oil separating and rising to the top. The ideal impregnation which it is aimed to attain, is ½ lb. of zinc and 3 lbs. of creosote per cubic foot.

The accompanying illustration shows the system of valves which control the treating fluid. Each of the three treating retorts has three valves, one for each process, viz.: (1) Card process; (2) Straight creosote; (3) Straight zinc chloride. These valves are opened and closed by turning the nine large wheels on the floor shown in the illustration. The row of valves on the left control cylinder No. 1, the row of valves

Valves Controlling Flow of Tie Preserving Fluid Into Treating Cylinders, Galesburg Plant.

on the center control cylinder No. 2, and the row on the right control cylinder No. 3.

Tests show that the red oak timber treated at this plant is impregnated clear to the center, and an average life of at least fifteen years is confidently expected from it. After tretatment (and this is especially true of the Card treatment) it is very essential that the ties be seasoned to allow the water of zinc chloride solution to evaporate. This requires only a short time in a dry climate. To facilitate evaporation, all ties are loaded in gondolas or stock cars; in the fall, stock cars only are used to guard against the ties being snowed on or getting covered with ice.

The tracks used for loading treated ties are on different levels, the one on which the tie trams of treated ties stand being higher than the track on which the cars stand which are to be loaded: the workmen have a practically level walk from the tie trams into the stock car. An ingenious tie loader is used to load ties from the trams into the stock cars. This device consists of two overhead tracks which are fastened to the roof beams of a car by clamps. These tracks run to opposite ends of the car, and curve at right angles out through the car door, and across the tracks on which the tie trams stand; the ends are held up by a timber support. A trolley wheel runs on the overhead rails, and a large right angled hook is suspended on a chain from the wheel. The relative height of the hook is changed as desired by hanging from the trolley wheel on different chain links. A man is stationed at the tie tram and lifts one end of the tie, when a second man slides the hook under the center and balances the tie on it. The tie is then given a shove and a swing and the man follows it up and stears the tie as the trolley runs along the track into one end of the car. In the meantime a third man runs out a second trolley and receives a tie which is run into the opposite end of the car. This tie loading device was patented by F. J. Angier.

The work of unloading and piling ties, loading trams, and loading cars is all done by piece work. This is proving to be very satisfactory, both from the standpoint of the laborer and the railway company. The work goes along with the minimum supervision, which is quite important where the work is scattered, the loading gang liable to be at one end of the yard and the unloading gang at the other. This supervision together with the attention required at the plant, would be pretty heavy but for the piece work system. Much has been done for the comfort of the laborers and to keep them satisfied. Loading freshly treated ties is extremely dirty work, as the oil soon penetrates the clothing of the laborer. This objection to that work was overcome by the installation of shower baths in a

special building at the instigation of J. H. Waterman, superintendent of timber preservation. Before that time it was very difficult to hold the men for loading the newly treated ties (which are very oily) although exceptionally good wages could be made. Since the shower baths have been put in, however, very little trouble has been experienced in keeping laborers on this work.

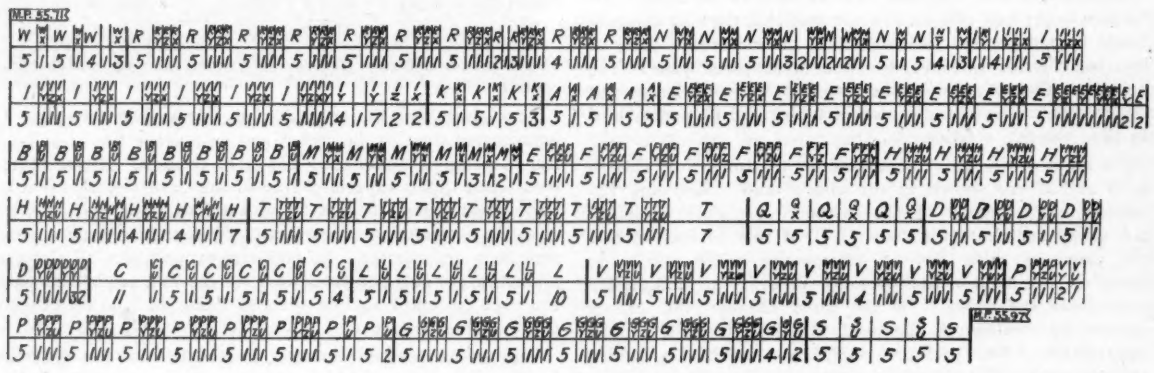
The Chicago, Bur'ington & Quincy is one of, if not the foremost, railway in the United States making thorough and accurate tests of ties. On each of the 25 divisions of the road there is a standard test section. These sections are located on stretches of track of which the foremen in charge are known to be exceptionally careful and trustworthy. In each of these sections 1000 ties were removed and ties were put in, in accordance with standard test section plans. One of these plans is shown herewith. The test sections, about 25 in number, are situated in the states of Colorado, South Dakota, Illinois, Iowa, Missouri, Nebraska and Wyoming, places being selected to get all different climatic conditions in the territory. Twenty kinds of wood are used untreated and treated; treatments used were the Card process, straight creosote, and straight zinc. The classes of ballast used in these different test sections include practically everything from dirt or gumbo, to crushed rock.

Some results are already available from ties that were put in out of face years before the establishment of the test section system. A red oak tie has been removed and is kept in the laboratory, the tie being absolutely sound, except where chopped by the tie plate, after being in track for 11 years. Another specimen of red oak untreated, removed after two years' use, shows bad decay.

In Wyoming, near Mystic, 30 rail lengths of red oak ties treated by the burnetizing process (zinc chloride) at the Edgemont, South Dakota, plant, were laid October 1, 1900. In this stretch of track 550 ties were originally placed. September 13, 1911, 548 ties were still in the track, 2 having been taken out and sent to the laboratory. The report on these ties September 11, 1911, says in substance: "So far, not a single tie has been removed on account of decay. The indications are that 8 ties may have to be removed in the spring of 1912, after 12 years' service. This is a most remarkable test. The ties for 3 or 4 rail lengths show that there has been a derailment, but none of the ties are broken. The life of a first class white oak tie is only about 8 years. The red oaks are on a 3 per cent grade and a 12 degree curve and have been in track 11 years and the indications are that at least 75 per cent will be in the track 15 years or more." The ties in the test mentioned are in the relatively dry climate of Wyoming, but below is given the results of a test in a wet climate.

At Jacksonville, Ill., a stretch of ten miles of track was built Nov. 19, 1903, to February, 1904. In this stretch of track red oak ties were used, treated with zinc chloride. These ties have now been in the track 8 years and about 1 per cent have been removed. It is estimated that about 5 per cent will have to come out next year. A recent inspection shows that many of these ties will certainly be in the track at least 15 years, probably 50 per cent of the number, and if tie plates had been used at least 75 per cent would have lasted 15 years. Nearly 95 per cent will have been in the track 8 years. The test shows that the red oak treated tie (and these ties were treated with zinc chloride, the cheapest and lightest treatment) will last much longer and give better service than the white oak untreated.

The following comment is made about the red oak ties: "The ties were removed in many instances because they were split when being laid. The track was laid in the winter when the grade and ties were frozen. Many of the ties were subjected to unevenly distributed loads on account of the frozen grade." Near the same place 6 miles of track was laid with white oak



REFERENCES

KIND OF WOOD		MARK
Ash		A
Beech		I
Birch	Red	B
Chestnut		Q
Cottonwood		D
Cypress		C
Elm	White	E
Hemlock		H
Hickory	Pignut	K
Loblolly Pine		P
Maple	Hard	M
Maple	Soft	F
Oak	White	W
Oak	Red	R
Oak	Pin	N
Poplar		L
Red Gum		G
Sycamore		S
Tamarack		T
Tupelo Gum		V

PROCESS	
KIND	MARK
CARD	No.
Straight Creosote	Y
Burnettizing	Z
Untreated Hard Wood	X
Untreated Soft Wood	U

Each Kind of Wood is Designated by a Letter Stamped on the Head of a Nail Driven Into Top Side of Tie about 34 Inches from One End.

A Tie Containing Only the Letter Designating the kind of Wood in Addition to the Dating Nail "09" Indicates it has been Treated by the Card Process.

Note:- All Ties Placed in Track June 1909, with 85# Rail, Red Ballast. All Ties Tie-Plated. Track on Tangent. Tie No.1. Located at Beecher Switch.

Note:- Letters Above the Line Indicate the Kind of Wood and the Process of Treatment. The Figures Below Indicate the Number of Ties. No Letters, nor Figures Above the Line Indicate that Ties are not Marked.

C. B. & Q. R. R. Standard Test Section, Containing 1,000 Experimental Ties.

ties in 1905, and 3,200 were removed in March and August, 1911, in addition to a number removed in 1910 on account of decay. That is, under similar conditions over 18 per cent of the white oak ties were removed in 6 years and about 6 per cent of the red oaks will have been removed after 8 years.

The equipment of the Galesburg treating plant consists of the following:

3 retorts or treating cylinders, ⅞ in. steel, length 132 feet, diameter 6 feet 2 ins., capacity about 700 ties, built by Allis Chalmers Co.

3 measuring tanks, diameter 10 feet, height 12 feet.

2 zinc chloride working tanks, diameter 24 feet, height 16 feet.

1 mixing tank for Card process, diameter 30 feet, height 24 feet.

1 creosote tank, diameter 15 feet, height 20 feet.

1 zinc chloride storage tank, diameter 20 feet, height 15 feet.

1 creosote storage tank, diameter 25 feet, height 30 feet, capacity 500,000 gallons.

In the experimental room there is: 1 small retort, capacity 4 ties; 1 experimental tank attached to the retort; 1 small pressure pump, 3x2x3 inches; 1 small centrifugal pump connected to a Western Electric motor.

Motors for operating the pumps are furnished by the Western Electric Co., and the Crocker Wheeler Co.

The number of tie trams has recently been increased to 235, so that enough loaded trams for one day's work for the treating plant can be kept in reserve, and the work not delayed when rain stops the unloading gang. In addition there are 45 trams for piling and heavy bridge timbers, and 8 cage trams for small material such as paving blocks, tie plugs, etc.

Mr. J. H. Waterman is Superintendent of Timber Preservation for the C., B. & Q. R. R.; Mr. August Meyers, who has had over eight years' experience in timber treating, is supervisor of the Galesburg plant. We are indebted to the above for the information used in this article.

Tie Yard, Office, and Tracks Leading to Treating Cylinders, Galesburg Plant.

1 water tank, capacity 100,000 gallons.

1 water tank, capacity 40,000 gallons. The tanks were made by the Chicago Bridge & Iron Works and the William Graver Tank Works.

3 Knowles special duplex piston pumps, 7½x4½x10 inches, with 4 inch suction and 3 inch discharge pipe, capacity 100 gallons per minute.

1 Knowles water pump, 6x4x6 inches.

2 boiler feed pumps, 1 condensation pump, 1 creosote pump, and 1 circulating pump for barometric condenser.

3 centrifugal circulating pumps driven by electric motors.

1 Knowles standard duplex underwriter's fire pump 18x10x12 inches, capacity 1,000 gallons per minute.

1 dry vacuum pump made by the Union Steam Pump Co., Battle Creek, Mich. All centrifugal pumps were made by Yeomans Bros., Chicago. All other pumps made by Knowles Steam Pump Works, Cambridge, Mass.

1 Ingersoll Rand air compressor, class H, 12x12 inches right hand and 18¼ by 12 inches left hand. Capacity 526 cubic feet of free air per minute.

1—80 H. P. Ball engine attached direct to a Crocker Wheeler horizontal generator, 100 k. w., 250 volts, 250 amperes, and 250 r. p. m. Electricity is generated for lighting purposes, as well as for running motors in the plant, and motors for two hoisting engines outside the building.

The boiler room contains three 150 h. p. boilers; also a Hoppes exhaust steam feed water heater, taking care of all condensation.

RAILROAD TIES PICKLED IN SALT LAKE.

Ten thousand railroad ties that have been "pickling" in Great Salt Lake, Utah, for the last three years, have recently been removed from that body of highly mineralized water and are now being transported to Hazen, Nev., there to be given a trial on the Hazen cut-off of the Southern Pacific Company. "Pickling" railroad ties in the Great Salt Lake is by no means a new experiment on the part of the railroad company.

There are ties on the old Promontory line of the Central Railway, which were placed there forty years ago and have not decayed, proving the preservative qualities of the salt formation in which they "pickled" for years before being laid on the roadbed. Piling is also being preserved in this lake, as excellent results have been obtained by the piling in the great trestle across the lake, which, since the day it was first placed in the first part of the construction of the Lucin cut-off, has shown no deterioration.

The ties that have just been removed from the Great Salt Lake will be subjected to a hard test in the alkali soils in Nevada. The "pickling" process has caused them to become heavily impregnated with salt and they act as a "ground" to the electric current in the block signal service. This fact makes them unfit for use on the main line of the company over which the block signals play a most important part.

The preserving of ties and piling in Great Salt Lake may become an important industry, if the experiments now being worked out prove as successful as former tests—Railway and Marine News.

SPECIFICATIONS FOR CONCRETE CONSTRUCTION.

The New York, New Haven & Hartford R. R., Edward Gagel, chief engineer, has recently completed a reinforced concrete round house of 43 stalls at Cedar Hill freight yards in the city of New Haven. It is a complete circle 360 ft. in diameter and is located on low ground near the Quinnipiac river, which necessitated an extensive use of piling in the foundation work. The entire round house, including the roof, is of reenforced concrete, and as this type of construction is rapidly coming into favor, we present below that portion of the specifications of the New Haven road which refer especially to the concrete and reenforcement work. These specifications are very complete and carefully worded and may well serve as a model and guide to others contemplating work of this character.

Masons' and Plasterers' Specifications.

All work included in this specification is subject to the "General Conditions" herein before written for the whole work.

Excavation.—The excavations are to be made of the depth, size, and form shown on plans, but 12 ins. or wider all around on the outside of foundations of all walls, piers, etc., as may be directed by the engineer. Bottom of foundation trenches and piers and other surfaces to be leveled off and graded to the required level, and well rammed ready to receive footings, walls or concrete floors as the case may be. Also excavation for heating, drain and soil pipes and ducts.

Filling and Back Filling.—As soon as the walls and pier foundations are carried above grade to the heights indicated on drawings or from time to time, when so directed by engineer in charge, fill in around same on all sides, and where shown on drawings. Filling next to the walls to be of clean coarse sand and gravel, all wetted and rammed down every 12 ins. in height. All earth fill around building to be carried within 12 ins. of finished grade. The final grading will be done by the railroad company. Surplus earth must be removed from the premises.

Cement.—The New York, New Haven & Hartford R. R. Company will furnish to the contractor all cement necessary for the performance of this work.

Broken Stone and Gravel.—All broken stone and gravel to be of an approved quality, screened and cleaned, and of a size that will pass through a 2-inch and be retained by a 1-inch round hole screen.

Piles.—The building will be supported on piles and concrete foundations in the manner shown on plans and sections. The piles are to be of yellow pine, spruce or chestnut. They must be 6 ins. at the tip and at least 10 ins. at the butt, when sawn off. They must be straight and trimmed close.

The piles must be driven into hard bottom or until they do not move more than one-half inch under the blow of a hammer weighing 2,000 lbs., falling 25 ft. in the last blow. They must be driven vertically, and at distances apart required by the plans. They must be cut off square at the heads, and when necessary, to be bound with iron hoops to prevent brooming.

All piles, when driven to the required depth, shall be cut off square and horizontal at elevation plus 0.5.

Sheet Piling and Bracing: Any sheet piling and bracing necessary for the excavation, foundation and other work is to be done by the contractor, to be securely braced and shored. Remove sheet piling and bracing, only when so ordered by the engineer.

Pumping.—Do all pumping necessary to keep the excavation free from water, pumping continuously, if required, for the proper excavation of the work.

Concrete.—For footings, walls, piers and concrete floors is to be in the proportion of one part cement, three parts sand and five parts of aggregates, consisting of broken stone and gravel, the gravel not comprising more than one-half the amount of aggregates, dry measure. For reinforced concrete, see elsewhere.

Concrete Mixing.—The concrete shall be machine mixed and to the satisfaction of the engineer. The requirements as to proportions and character of mix will be rigorously enforced. Concrete is to be mixed only as required for immediate use, and any that has been mixed for a period exceeding 30 minutes is not to be used under any circumstances, but must be removed from the premises at once.

Forms.—The concrete is to be laid within tight plank forms or moulds in layers not more than 12 ins. in thickness if so directed, and thoroughly puddled or rammed as directed. Care must be taken to spade the concrete closely to the sides of forms so as to leave no holes or voids in the surfaces. Before adding next layer, sweep clean with broom and wet down the preceding one.

Plank curbs are not to be less than 1½ ins. thick, to be rigidly braced to prevent bulging out of the sides. Moulds and braces are not to be removed until the concrete has thoroughly set or until directed by the engineer.

Concrete Walls.—All foundation walls, piers and footings throughout, including exterior foundation walls and piers, piers and footings for columns, walls and footings for engine and drop pits, are to be of concrete, of the size and dimensions shown on drawings, to commence on pile foundations 7 ft. 6 ins. below grade or as otherwise shown, all to be carried up to elevation 7.5 as indicated on drawings.

Steel Rails.—All steel rails used in concrete walls and elsewhere for reinforcement will be furnished by the railroad company, but must be installed by the contractor under direction of the engineer. Rails to be thoroughly cleaned by contractor.

Concrete Floors.—The floors of engine pits are to be of concrete as shown, to be crowned 4 ins. at center forming gutters on each side, and graded to catch basin at the end of pits. Form ledges and rabbits for gratings and other iron work. Floors to be of the various thicknesses and dimensions shown.

Concrete Finish.—Cement finish will be required for floors in the drop and engine pits, also the heating duct. The finish in the heating duct will be ½ in. thick, that in the pit 1 in. thick, the cement finish is to be laid immediately after the rough concreting is finished, to properly combine with same. The catch basin and depressions for jacks in pits are to have no finish, but the rough concrete will be floated off smooth and even.

Cleaning concrete.—After the concrete walls, etc., are thoroughly dry, they are to be cleaned and scrubbed with wire brushes, the surfaces are to be patched up with concrete wherever necessary, and have a thin coat of cement finish over same.

Anchors, Bolts, Etc.—The contractor is to set accurately all anchors, bolts, pipe dowels, eye bolts, putty wall plugs, etc., that may be required by other mechanics. The above to be furnished under another heading.

All other concrete construction throughout will be reinforced as shown on drawings, and as hereinafter specified.

The whole floor area of engine house will be laid with cinders. This work will be done by the railroad company. All other cinder foundations for pits, etc., must be furnished by the contractor. Cinders supplied by the railroad company.

Vitrified Heating Pipes.—The contractor will furnish and lay under the direction of the heating contractor all salt glazed sewer pipe used for heating purposes. These pipes lead from the main heating duct to engine pits. To have the ⅛ bends, increasers and Y branches. The main decreases in

size from concrete duct to sewer pipe directly back of the branches.

Specifications for Reinforced Concrete.

All work included under this heading is to be subject to the general conditions, hereinbefore written for the entire work.

The work called for under these specifications calls for the following to be done in reinforced concrete: Roof, beams, girders, columns, lintels, slabs over heating duct, engine and drop pits, also columns and platforms for heating apparatus, which must be performed in strict accordance with detail plans of the railroad company unless otherwise agreed.

Reinforcing bars shall be of corrugated or twisted square section or other section giving equal mechanical bond approved by the engineer.

Properties.—Steel shall have the following properties: Ultimate tensile strength not less than 60,000 lbs. Elastic limit not less than one-half of the ultimate strength nor more than 45,000 lbs.

Elongation not less than 20 per cent in 8 ins.

Bending test 180 degs., flat on itself, without fracture on outside portions of bent fracture.

Wood Centering Moulds, Etc.—Must be in sufficient amount for the proper prosecution of the work, and to the satisfaction of the engineer, and no centering is to be struck except as permitted by the engineer.

The contractor must place properly in the concrete all necessary wood blocks, nailing strips, rutty wall plugs, anchors, bolts and hangers for other mechanics.

Centering.—Must be true and rigid, thoroughly braced both laterally and diagonally and sufficiently strong to easily carry the dead weight of construction without deflection.

Rigid care must be exercised in seeing that all columns are plumb and true and thoroughly cross braced to keep them so, the foot of each column box must remain open on one side for adjusting reinforcement, cleaning of bottom, and inspection by the engineer in charge, this opening to remain open until the first wheel barrow is waiting above.

For all exposed concrete work especial care must be taken in centering, using, as far as possible, new lumber to insure concrete free from honey comb, or other disfigurement.

All exposed corners and edges of beams, girders, columns and the like shall be beveled not less than 1¼ ins. and the contractor must make suitable and proper provision for this in the forms.

Removal of Centering.—The centering must be built so that two sides of columns can be removed first, then roof and floor beams, then sides of beams and girders, and remaining sides of columns. No centering to be removed until so directed by the engineer in charge.

Finished Surfaces.—Any holes or uneven surfaces showing after centering has been removed are to be neatly cemented, and any projection, or excess of material beyond the required surface, must be chiseled off. All exposed surfaces to be pointed up and given a heavy wash of cement.

Concrete for Reinforced Construction.—All cement mortar and other materials used in reinforced concrete work, unless otherwise specified below, shall comply in all respects with the requirements, specified under headings of "Mason Work" except that the broken stone and gravel shall be ½ in. in diameter for columns, girders and beams and floor and roof slabs.

Concrete for reinforced concrete work, unless otherwise specified, shall be composed of one part cement, two parts sand, four parts broken stone and gravel.

Mixing.—The concrete must be mixed to the satisfaction of the engineer, and the requirement as to proportions and character of mix will be rigorously enforced.

Paving.—All forms must be absolutely clean and free from shavings, before pouring commences.

The concrete must be placed as rapidly as possible after mixing and thoroughly worked in place, particular care being taken to secure a good face.

Columns.—All columns, unless otherwise specified, are of reinforced concrete; all splices of reinforcement must be properly made, and steel bars and hoopings to be carefully placed and secured, and all necessary anchors and other metal work must be provided and placed before concrete is placed in forms.

Structural Steel.—All structural steel and iron work in connection with the erection of the reinforced concrete work to be furnished, erected, and installed under this heading. Steel used to be "medium steel," all to be in accordance with the "Manufacturers' Standard Specification," and standard specifications for workmanship to be Carnegie Company's, or equal.

Beams and Girders.—Beams and girders of reinforced concrete to be formed where shown in roof and platform for heating apparatus. Properly place the steel reinforcing bars, care being taken that steel is properly raised up from wood forms to permit of fire proofing, corners being beveled. Properly imbed into beams wrought iron pipe sleeves for electric wires.

Platform Floor.—Will be reinforced in accordance with the plans or as approved by the engineer.

The contractor is to form openings in the roof for smoke jacks where indicated on plans, also make other openings that may be required for ladder and platform for heating apparatus, properly framed around same.

Expanded Metal Reinforcement.—The work called for under this heading consists of the reinforcing of cover slabs of large heating duct, catch basin in engine pits, floor of drop pits, and wherever may be necessary or so directed by the engineer.

The expanded metal shall be laid with the long way of the diamond meshes extending in a direction transversely to supports, the separate sheets shall be lapped one mesh on the side and one or more meshes on the ends with No. 18 annealed steel wire. The concrete shall be deposited through the meshes of the expanded metal, keeping the metal about ¾ in. above the bottom of the slab.

The expanded metal will be No. 16 gauge, 2½ mesh.

Supervision.—There must be in charge of the reinforced concrete work a thoroughly capable superintendent, with large experience in this form of construction and the setting of forms, the placing of steel, the mixing and placing of concrete, the removal of forms. Each must be done only under the close personal supervision of competent foreman. The contractor shall furnish such certified records regarding the work as may be requested by the engineer.

Protection.—Should any part of the construction be exposed to freezing weather, the same must be covered with boards and paper or canvas, as directed to prevent damage by frost. The contractor must provide any other protection required by the engineer.

All work at completion must be in proper condition to receive the succeeding work.

The A. T. & S. F. plans on the following improvements in Arizona for the near future: remodeling of interlocking plant at Ash Fork, to cost $5,000; drilling deep well at Pica at a cost of $22,000; constructing a deep well at Houck, to cost $4,400.

According to reports, the Southern Pacific of Mexico will soon make application to the Mexican government for a concession, to build an extension from Tepic to a connection with the Pan-American and the National Tehuantepec railways, about 900 miles. The proposed route is down the Pacific coast, in some places hugging close to the ocean in order to obtain a passageway.

22 Stall Engine House, London, Ont., C. P. Ry.

By J. W. Orrock, Chief Draftsman and Assistant Engineer.

There is being completed for the Canadian Pacific Railway a 22-stall engine house at London, Ont., including an annex, which provides a machine shop and boiler house, with office and other facilities for the locomotive foreman. The house is divided into two portions of eleven stalls each by a fire wall in the center and is 85 feet deep, each stall measuring 25 feet 8½ inches between centers of pilasters in the rear and 13 feet 7 inches between centers of columns in front.

It will be noted on one of the drawings that the three bays in front of the machine shop, where the truck wheel and drop pits are located, are 95 feet deep, the rear portion of the bay being taken up by the boiler washout plant, built and installed by the National Boiler Washing Co., Ltd., Montreal, Que.

The machine and boiler room is divided by a concrete fire wall having a communicating fire door. The boiler room is about 34 feet by 50 feet and will accommodate three 100-h. p. locomotive type stationary boilers, connecting with an independent chimney 11 feet 6 inches at the base and 100 feet high.

Framing of Round House, London, Ont.

Machine Shop.

The machine shop, with offices, is about 60 feet by 50 feet and provides a large lavatory, locomotive foreman and clerks' offices and a registry room or booking office.

The construction of the house is plainly shown on the cross-sections and consists of concrete foundations and walls with a steel frame encased in concrete and a mill construction roof. The cost of a steel frame encased in concrete is about the same as reinforced concrete, and in some cases the contractor has the option. The steel frames, however, can be erected and the house roofed over very rapidly, which is an advantage.

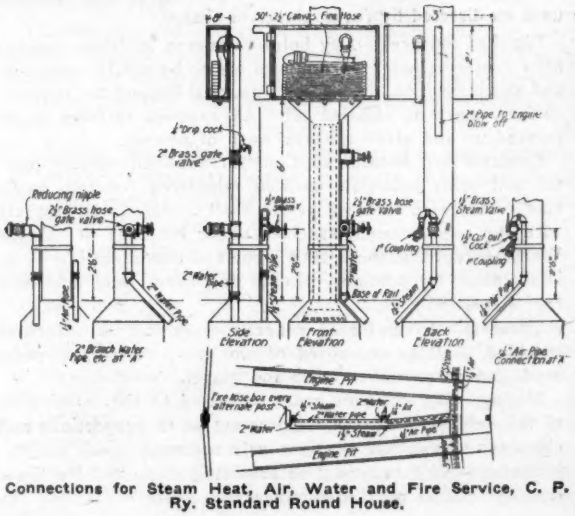
Standard Engine House.

This type of house was adopted by the Canadian Pacific Railway after some experience with all concrete and steel constructions, and has been entirely satisfactory. It is reasonable in first cost and is practically fireproof. Generally speaking the cost of this type of house complete ranges from $2,800.00 to $3,300.00 per stall, depending on location and local conditions. This price does not include the boiler washout plant which is really not part of the house, but rather a portion of the equipment.

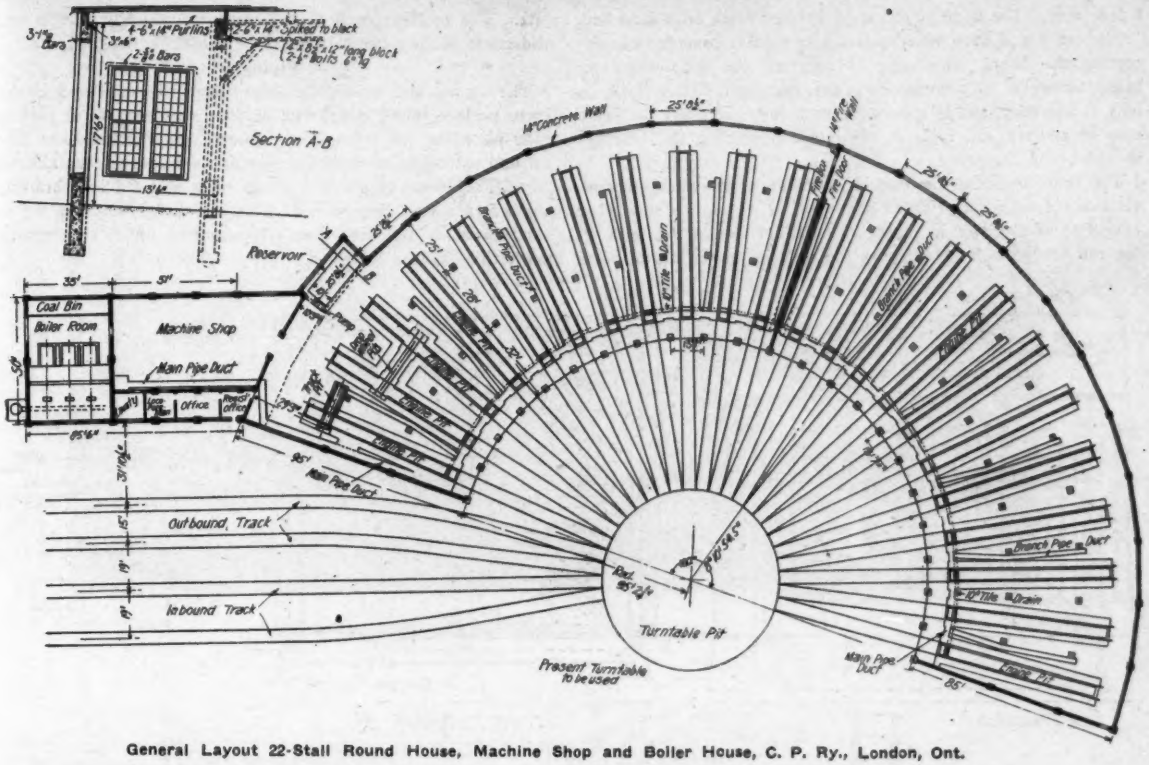
The doors are solid without lights, with large transom lights over; in the rear all the space available is used for the windows. The roof is covered with a tar and gravel built up roof, flashed up 12 inches on the firewalls and over and under all eaves. There are no water troughs or conductors. All of the water falls to the rear, and a slight extra slope is given the back portion to prevent ice accumulating immediately over the wall portion, as it is very likely to do from alternate thawing and freezing when the slope is too little to cause a run off under these conditions.

Pits.

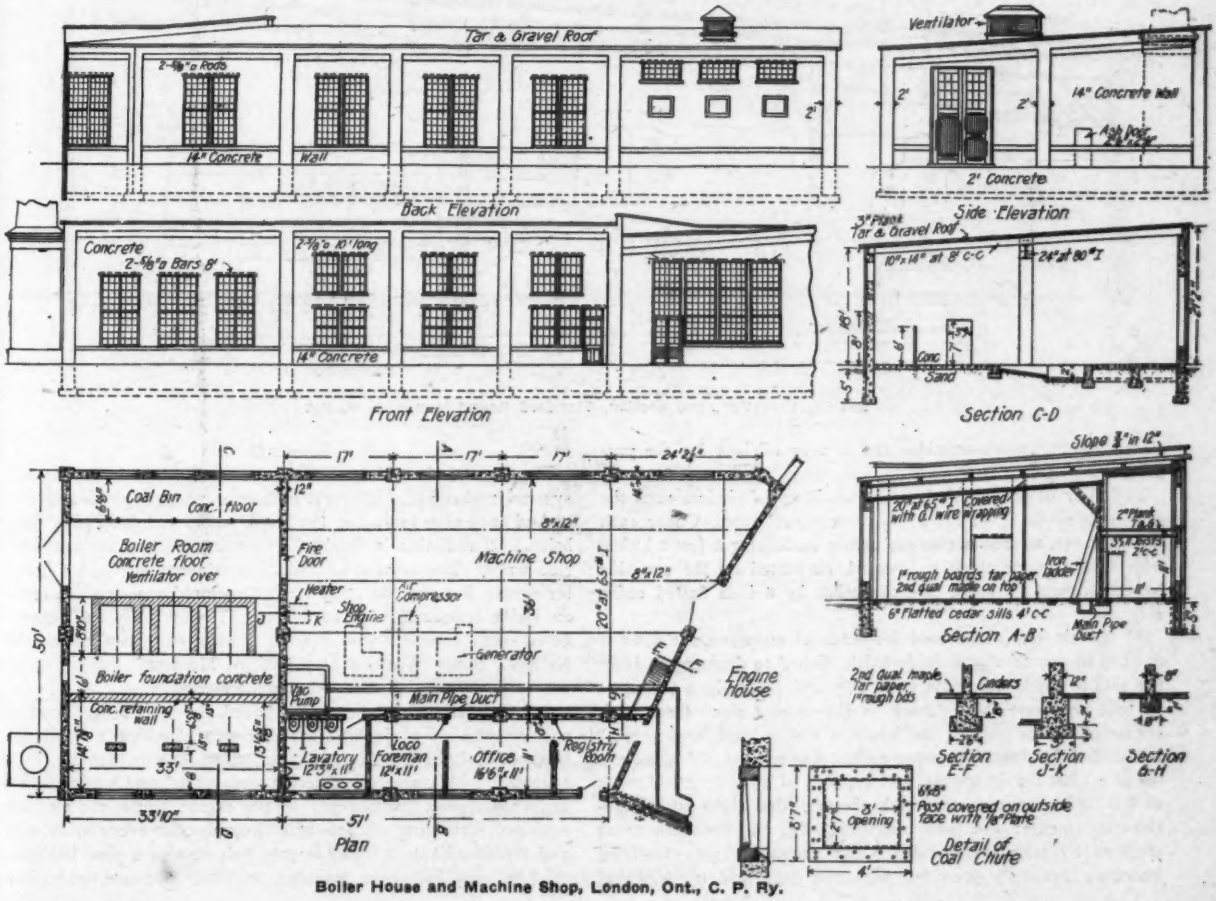
The engine pits are 4 feet wide and 65 feet long, 2 feet 4 ins. deep at the rear end, and 2 feet 10 ins. at the front. The walls are of concrete 17 inches thick with footings 18 inches thick and



Connections for Steam Heat, Air, Water and Fire Service, C. P. Ry. Standard Round House.



General Layout 22-Stall Round House, Machine Shop and Boiler House, C. P. Ry., London, Ont.



Boiler House and Machine Shop, London, Ont., C. P. Ry.

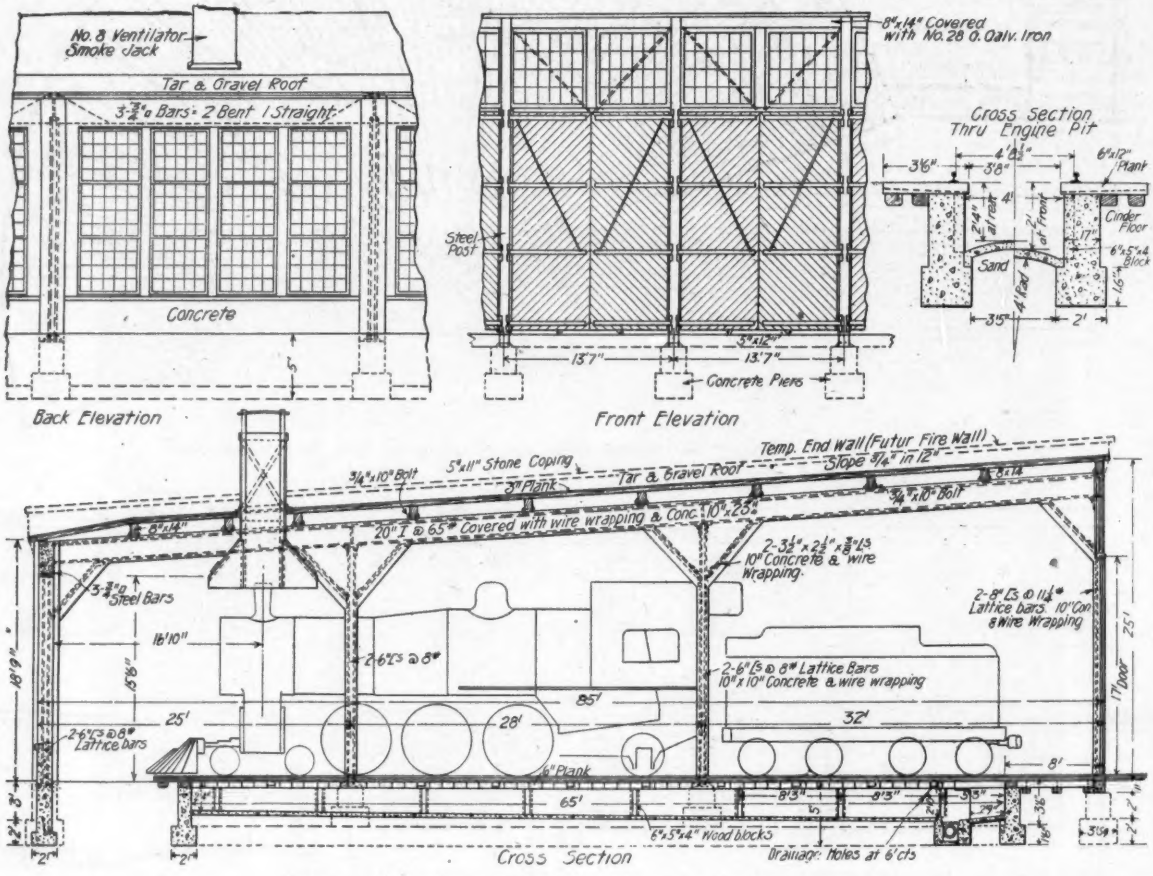
2 feet wide. The floor of pits is of vitrified brick on a sand bed.

The truck and drop wheel pits are of similar construction, excepting the floors, which are of concrete, the drop wheel pit being arranged to accommodate the telescopic lifting jack, is only 6 feet deep, and is spanned with a rail, and truss bar beam easy to remove and replace; the plank supporting the bearings should be of hardwood.

The beam spanning the opening over the track wheel pit consists of a double rail, riveted base to base, the lower rail being cut off so as to give 2 in. clearance on either side of the opening; the rail bridge lock for keeping the rails in line is one of some pits. The trolley track to the machine which connects with the cross trolley track is not to be installed at present.

Piping.

The steam, air, water, and other pipes are conveyed in concrete surface ducts, which run between and connect at each engine pit along the front of the house with branch ducts taken off and extending towards the rear of the house at each alternate bay. The steam supply is a 3 inch main and 1½ inch branches, the water main 3 inches with 2 inch branches, and the air line throughout is 1¼ inch pipe all connected up and terminating with the fixtures installed.



Details, Elevation, and Section, Standard Round House, C. P. Ry.

locomotive foreman's wrinkles and is very efficient for the purpose.

The floor of the engine house is made up of cinders until the ground is rendered fit for a more permanent type. Under each rail, however, at each engine pit, a strip of flooring 3 feet 6 inches wide and 6 inches thick is inserted, supported on the one side by the engine pit wells, and the other by 6 inch flatted cedar sills.

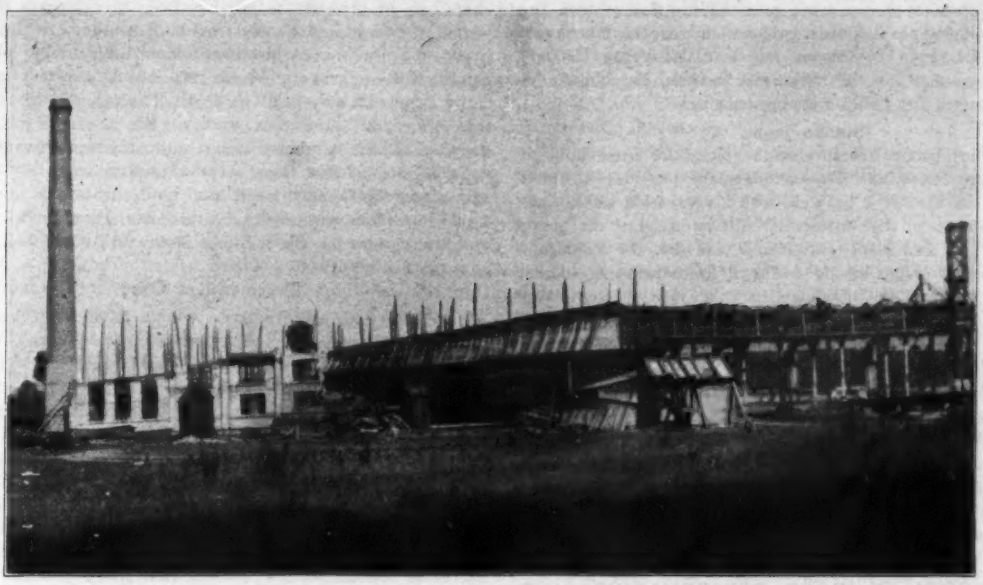
At the six pits to be used for washout purposes, the floor is finished in concrete granolithic finish, dished to drain away from the pits towards the posts, with trap and drain pipes arranged to take the waste water back to the engine pits. Over each engine pit at the rear of the house, a trolley track arrangement is installed for handling piston rods, cylinder heads, etc., not exceeding 1,000 lbs. in weight, and consists of an inverted U track at 7 ft. 2 ins. centres, in which are provided eight wheel carriers to transfer the load longitudinally; and movable cross trolleys to take it laterally. The movable cross trolleys, however, are only provided over the drop and truck wheel

Heating.

The house is heated by direct radiation, low pressure vacuum system, and consists of five 2 inch coils on both sides and one end of each pipe including the truck wheel and drop pits. The balance of radiation is obtained by placing coils on the rear and side walls. The amount of radiation is about one and a quarter square feet per 100 cubic feet of enclosed space, which gives an inside temperature of 50 degrees F. when it is ten degrees below zero outside. The heating system was installed by the National Boiler Washing Co., Ltd., of Montreal.

Boiler Washing System.

A boiler washout plant, as mentioned above, is being installed and consists of a six stall installation comprising a combined washout and filling water rseervoir, 12,000 gallons capacity, fully equipped, with condenser, filtering, separating, and sludge tanks, including duplex pumps, etc. In the engine house, six pits are equipped with blow out line with drop pipes at every other post and terminating with suitable gate valves, also a pipe line that may be used for either washing or filling purposes, with drop



22-Stall Engine House and Machine Shop, London, Ont.

Bill of Material
Support for Trolley Track along Engine Pit

No. Pcs.	Size	Length	Location
2	6"x10"	34'	Runway beams
4	6"x6"	16'	Hangers
60	⅝ ø	14"	Bolts
120			Cor. Washers

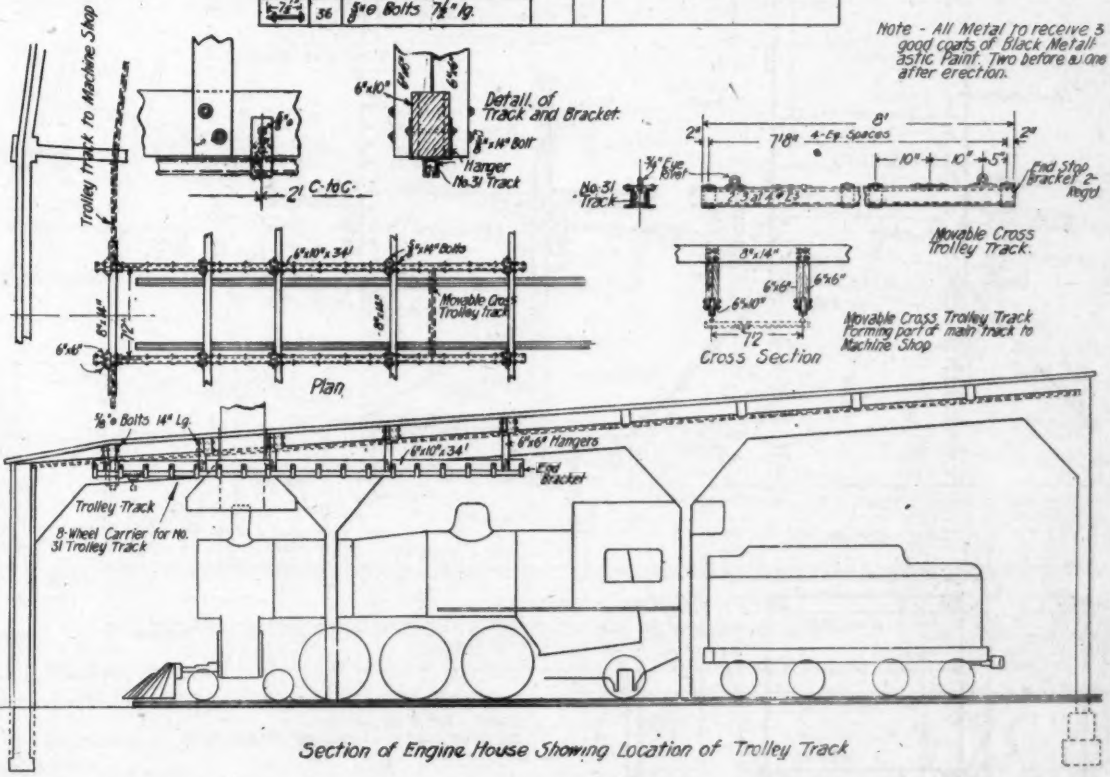
Bill of Material
Trolley Track along Engine Pit

No. Reqd.	
2	8 Wheel Carriers
2	34' lengths No. 31 Track
52	Hangers
4	End Stop Hangers
56	⅝ ø Bolts 7½" lg.

Bill of Material
Movable Cross Trolley Track

No. Reqd.	
1	8 Wheel Carrier
1	1-8'-0" Length No. 31 Trolley Track enclosed in Movable Cross Trolley track - 2.3" at 4" c-c with eye Rivets tie plates. Brackets & Stops.

Note - All Metal to receive 3 good coats of Black Metallastic Paint. Two before & one after erection.


Trolley track to Machine Shop
2'-0" C. to C.
Detail of Track and Bracket
Hanger No. 31 Track
Plan
Movable Cross Trolley Track.
Cross Section
Movable Cross Trolley Track forming part of main track to Machine Shop
Section of Engine House Showing Location of Trolley Track
Trolley Track
8-Wheel Carrier for No. 31 Trolley Track
End Bracket

Standard No. 4 Engine House, C. P. Ry.

pipes and valves at every other post. With this system, the heat units (including the water) blown out of the locomotive boilers will be saved, the blown out steam being used to heat a fresh body of water for filling the boilers, the blown out water being used for boiler washing purposes.

Smoke Jacks.

The Gutelius patent asbestos smoke jacks are used, built of 3/16-in. asbestos material. The arrangement provides a smoke hood 8 ft. 9 in. by 3 ft. 0 in. wide with a ventilating smoke jack 3 ft. 6 in. square on the outside. It will be noted at the points marked "A" on the side elevation and plan that the inside and outside sheets overlap, leaving a 3 inch space between, so that any smoke escaping the hood goes up the Jack through these openings.

General.

Messrs. J. Hayman & Sons, London, are the building contractors; Messrs. Byers & Anglin, contractors, Montreal, built the power house chimney, and the National Boiler Washing Co. has the contract for the heating and boiler washout plant.

A. L. Hertzberg, division engineer, and F. W. Cooper, resident engineer, have charge of the construction work, under the supervision of Mr. J. M. R. Fairbairn, acting assistant chief engineer, Canadian Pacific Ry.

CONSUMPTION OF WOOD PRESERVATIVES AND QUANTITY OF WOOD TREATED IN THE UNITED STATES IN 1910.*

By H. S. Sackett, Chief, Office of Wood Utilization.

Introduction.

Although the practice of impregnating wood with various chemicals to prolong its life has been in existence for many years, the commercial treatment of timber in the United States did not begin until 1848, when a Kyanizing plant was established at Lowell, Mass. About 1874 a treating plant using creosote was built at West Pascagoula, Miss. From that time until the first part of the present century the growth of the timber-treating industry was gradual, and even as late as 1904 there were approximately only 30 treating plants in operation in the United States. Since that time, however, wood preservation has grown very rapidly, and there were in the United States in 1909 more than 80 commercial plants.

Preservatives Used.

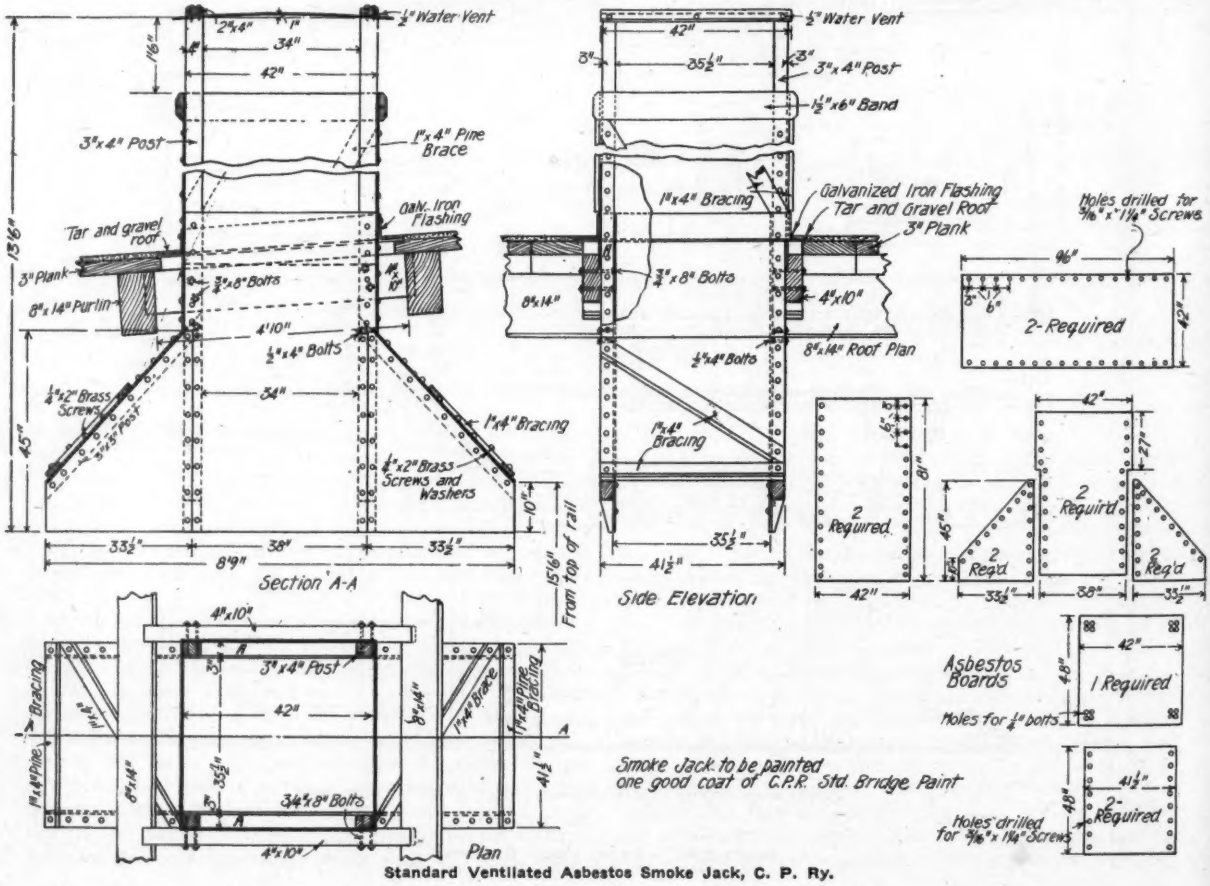
The principal preservatives which have been used from time to time include creosote, zinc chloride, corrosive sublimate, and crude oil. The ones most largely used at present are creosote and zinc chloride, in the order named.

In 1910 over 63 million gallons of creosote and nearly 17 million pounds of zinc chloride were used in preserving timber in the United States. There were also used small quantities of corrosive sublimate, water-gas tar, crude oil, and refined coal tar. These figures are based upon reports of 29 firms operating 71 treating plants, which represent 96 per cent of the plants in operation during that year, and show a greater consumption of cresote than has ever been reported in any previous year.

Table 1.—Consumption of creosote and zinc chloride in the United States in 1908, 1909 and 1910.

Years.	Creosote. Gallons.	Zinc Chloride. Pounds.	Firms Reporting.	Number of Plants.
1908	56,000,000	19,000,000	44	64

*Bulletin of the U. S. Department of Agriculture, August, 1911.



Standard Ventilated Asbestos Smoke Jack, C. P. Ry.

1909	51,431,212	16,215,107	46	64
1910	63,266,271	16,802,532	49	71

Source of Preservatives.

Since timber treating began on a commercial scale in the United States the domestic supply of creosote has never been equal to the needs of the industry. With the rapid development of wood preservation in recent years the insufficiency of the home production has become more marked. Table 2 shows the relative amounts of domestic and imported creosote used during the three years ending in 1910.

Table 2.—Relative amounts of domestic and imported creosote used in the United States in 1908, 1909, and 1910.

Years	Total gallons creosote used.	Domestic creosote. Gallons.	Per cent of total.	Imported creosote. Gallons.	Per cent of total.
1908	56,000,000	17,360,000	31	38,640,000	69
1909	51,431,212	13,862,171	27	37,569,041	73
1910	63,266,271	18,184,355	29	45,081,916	71

Nearly three-fourths of the imported creosote came from England and Germany; some was obtained from other European countries and some from Nova Scotia. The domestic creosote was obtained chiefly in New York, Philadelphia, Chicago, and other large cities.

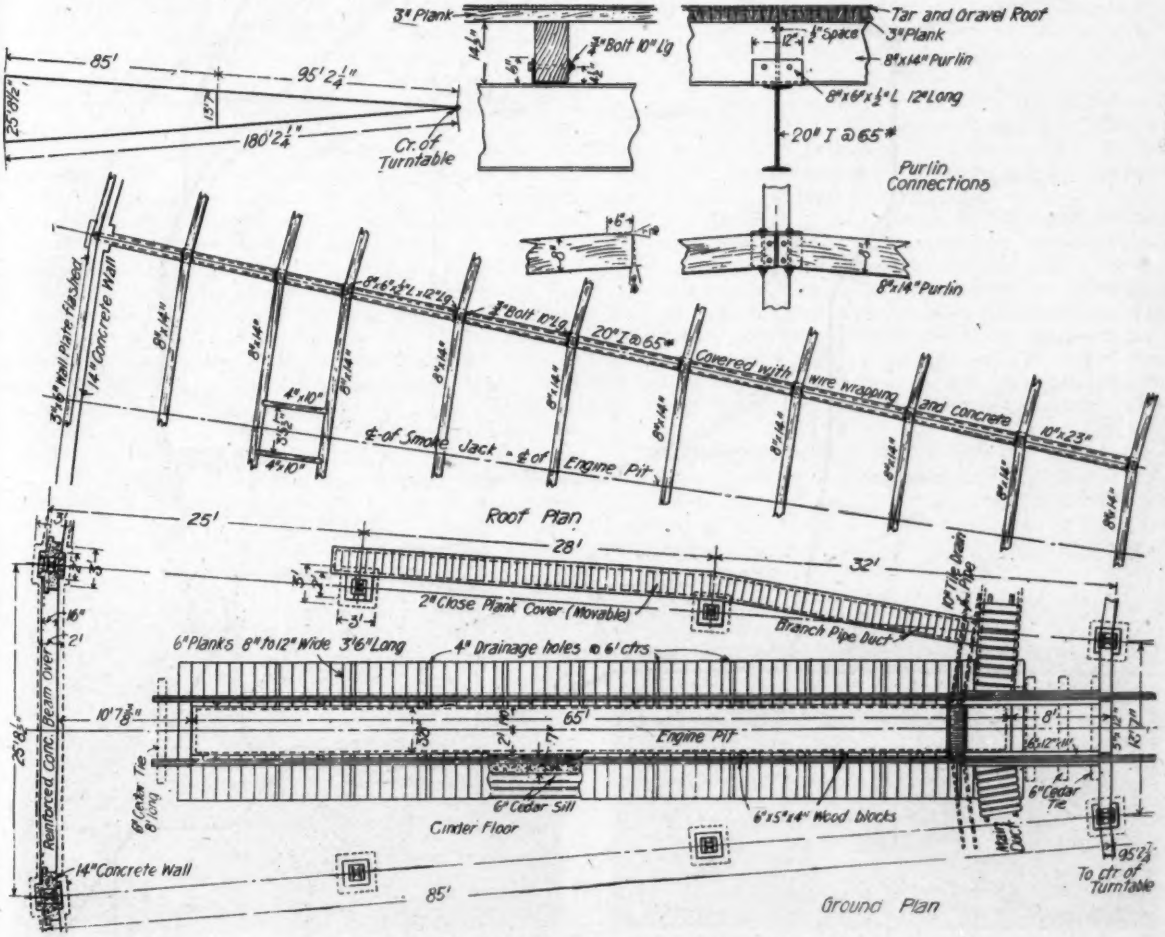
Were all the tar produced, which the coal annually coked in the beehive and by-product ovens in the United States is capable of yielding, it would distill considerably more creosote than is now used in preserving wood in this country. Unfortunately, American operators do not even get the fullest use of the limited quantity of coal tar made in this country, for it does not pay the operators to distill coal tar for creosote alone; so, unless they can find a market for the associated products, it is not separated. Germany has gone far ahead of the United States in the development of coal-tar products, and European exports of creosote to this country are steadily increasing.

The zinc chloride used in wood preservation was all obtained from domestic sources, according to the reports, most of it being produced by a few large chemical companies.

Material Treated.

Seventy-one plants reported a treatment of 17,933,918 hewed ties and 8,500,657 sawed ties during 1910. There were also treated by these plants 9,383,366 board feet of switch ties; 1,402,109 board feet of bridge ties; 7,826,749 lineal feet of piling; 1,809,723 square yards of paving blocks, 85 per cent of which were yellow pine, the remainder being made up of Douglas fir, red gum, larch, and Norway pine; 453,462 lineal feet of poles; 142,093 cross-arms; 43,648,101 board feet of bridge timbers; and 49,638,844 board feet of other construction timbers. Approximately 30 million board feet of various other materials, such as, posts, flooring, mine timbers, wood conduits, car sills, car flooring, tie plugs, barge timbers, etc., were also treated.

Of the approximately 100 million cubic feet of material treated in 1910 with creosote and with zinc chloride, considerably more than half was treated with creosote. In 1909 there was less material treated by these preservatives than in 1908; 1910, however, shows a decided increase in the amount of material treated.



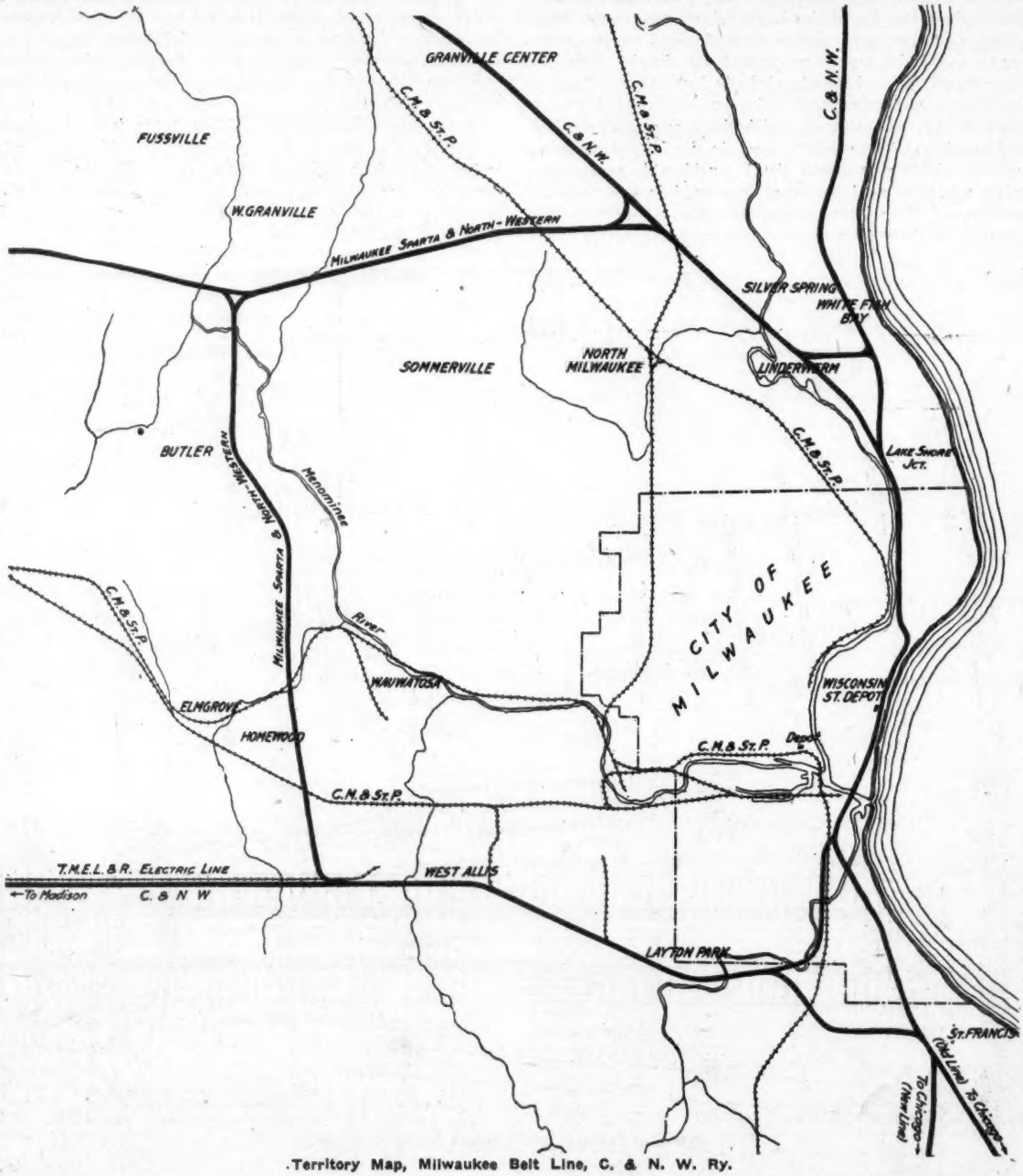
Details of Standard No. 4 Round House, C. P. Ry.

Cross ties are particularly liable to decay, since they are used under conditions which are favorable to the growth of wood-destroying fungi. Consequently, the railroads have always taken a leading part in timber preservation in the United States. Fifteen railroads report the operation of timber-treating plants; many also have ties and other materials treated by commercial plants.

The perusal of the individual reports for 1910 shows also a tendency toward the treatment of certain classes of material which have not heretofore been treated to any great extent. For example, the railroads report the treatment of large amounts of tie plugs, pole brackets, fence posts, pole steps, tunnel wedges, and planks. Other commercial concerns also report a treatment of much material which goes into conduit and sewer pipes, barge timbers, and lumber for use in exposed places. The treatment of mine timbers also shows a decided increase.

C. & N. W. RY. BELT LINE, MILWAUKEE.

The new double-track line now being built by the Chicago & Northwestern Railway from Lake Shore Jct., on the Wisconsin Division, west to Butler Jct., and south to West Allis, on the Madison Division, will form a belt line that completely encircles the city of Milwaukee. That portion of the line from Wisconsin Division Jct. west will be part of the new branch now being built to Sparta. Formerly through traffic was routed through the city from Lake Shore Junction as far around as West Allis, both local and through business traversing a narrow throat in the city along the lake front. When the Belt Line and the new line to Sparta are finished, business originating at and destined to points beyond Milwaukee will be moved via the Milwaukee, Sparta & Northwestern, thus eliminating the congestion incidental to the mixture of local and through traffic, and making it practicable both to better serve the industries already



Territory Map, Milwaukee Belt Line, C. & N. W. Ry.

Method of Making Hill Fill from Temporary Trestle.

Tower Which Was Used for Distributing Concrete, Bridge at Station 139+.

located on the Northwestern and to open up a large new territory suitable to industrial development.

Construction work was begun in the spring of 1910 and is still under way. From West Allis west for about a mile and a quarter the work is along the existing track of the Madison Division. There the line turns north, crossing the tracks of the T. M. E. R. & L. Ry., which is adjacent and parallel to the old C. & N. W. Ry . At this point an overhead crossing and a long fill approach were necessary, which necessitated the construction of a detour for the old Madison Division track around the high fill and a bridge on a 6-degree curve to span four tracks of the T. M. E. R. & L.

The line from the Madison Division north is through a rough country for about four miles and the grading and bridge work were heavy. The first railway crossing is at Sta. 3+, mentioned above; this bridge is a four-span through plate girder with trough floor on concrete substructure. The next one, at Sta. 67+, crosses the La Crosse Division of the C., M. & St. P. Ry. This bridge is a through-riveted span 170 feet long on submerged concrete abutments. The next bridge, at Sta. 139+, is over the Prairie du Chien Division of the C., M. & St. P. Ry., Watertown Plank Road, and Underwood Creek. This bridge has five deck plate girder spans over the highway and creek, an 182-foot through lattice span over the railway and another deck plate girder to the north abutment. Both of these abutments also are of the submerged types. The entire substructure is of concrete. The remainder of the structures north to Butler Jct. are waterways consisting of concrete arches, concrete boxes and cast-iron pipes. At Sta. 396, where the Menominie River is crossed, is a triple arch, the two outside arches having a span of 32 feet and middle one 40 feet.

The grading for the first four miles north of the Madison Division was nearly all done with steam shovels and car outfits hauled by engine. Blue Mound Cut—widened for borrow—supplied the material for the fills from Watertown Road, about Sta. 136, to the Madison Division, about 450,000 cu. yds. in all, a small part of this being side borrow. North Avenue Cut supplied the remainder of the material for the four miles—about 90,000 cu. yds. The rest of the work north to Butler Jct.—except in Butler Yards—was comparatively light. The heavy fills were nearly all made from high trestles, the contractor constructing the trestles to grade and then operating for the most part standard gauge equipment. The new yards, roundhouse, etc., are located at Butler. The yards have wye connection with the line to Sparta, so that freight can be sent by West Allis to Chicago without going through the Milwaukee Yards. The freight yards have a large capacity and the roundhouse is a complete circle—60 stalls. At Butler there is a power house, machine shop, coal chute, railway men's clubhouse and the numerous other buildings necessary to such a plant.

From Lake Shore Jct. northwest to Wisconsin Division Jct., about two miles north of Lindworm, the work consisted mostly of widening embankments and bridges for second-track construction. The bridge over the Milwaukee River is a double-track through plate girder 80-foot span, the masonry piers of the old bridge being entirely encased in concrete when widened for the second track. Near Wisconsin Division Jct. there is another bridge spanning the C., M. & St. P. Ry. and the Milwaukee Northern Electric Ry.

Wisconsin Division Jct.—Sta. 00—is where the new line leaves the Wisconsin Division and turns west toward Butler Jct. At Sta. 91+ there is a bridge exactly like the one described at Sta. 67+ on the West Allis-Butler line; the latter bridge also spans the C., M. & St. P. Ry. This bridge,

Form Work for Concrete Arches, Station 396.

10 Foot Concrete Arch, Station 178+70.

like the first mentioned, is a ballast floor girder on a concrete substructure over the old Fond du Lac road at Sta. 247. The remainder of the openings are for drainage and consist of concrete arches and boxes and cast-iron pipe.

The earthwork in this section was also fairly heavy and was taken care of by steam shovels and car outfits. The widened cut near Wisconsin Division Junction was taken out by a standard gauge outfit; they handled about 170,000 cu. yds. Another cut between stations 114 and 152 yielded about 200,000 cu. yds.

Throughout the whole line—except in yards and sidetracks—90 lb. A. R. A. rail was used and automatic signals are being installed. The switches at the various junctions are all operated manually from towers. On the main line treated ties (creosote process) and gravel ballast are used; all grades are compensated for curvature.

The work on the Milwaukee Belt Line was performed under the supervision of E. C. Carter, chief engineer, D. Rounseville, resident engineer. The assistant engineers in direct charge of construction were N. Mann and W. A. Brewer, and to the latter we are indebted for the above information.

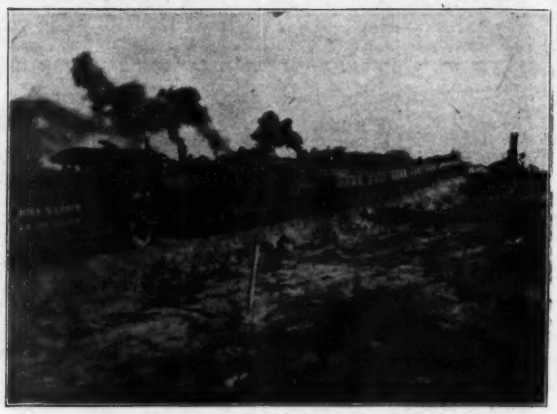
Bucyrus 97C Steam Shovel Starting Work at Blue Mound Cut.

CROSS-TIE RECORDS, A. T. & S. F.

A system of keeping cross-tie records for the purpose of studying the relative merits of various woods, preservative treatments and rail fastenings has been introduced on the Atchison, Topeka & Santa Fe, in which observations on selected short sections of track are substituted for the collection of data on all ties put in the tracks. The plan has been in operation about a year so that its utility is now established.

Prior to May, 1910, every tie inserted either in main track or side track was marked with a dating nail showing the year in which it was placed, a round-head nail indicating a treated tie and a square-head nail an untreated tie. A report was made each month by every section foreman, showing the ties placed in and removed from the track on his section. All of the data thus supplied were compiled in the office records. This method was considered unsatisfactory, due to the difficulty in getting correct information from all section foremen. It was therefore decided to abandon it and substitute a system in which carefully prepared, reliable data from a representative section would give an index to conditions on an entire division. Each section under observation was placed under the supervision of an experienced and careful foreman.

At the time of starting the new system an actual inventory was taken of the ties in the track on each selected section. Under its operation all ties inserted in any section are marked with dating nails, as formerly, but no ties elsewhere are so marked. Dating nails are placed uniformly



Steam Shovel and Car Outfit, Blue Mound Cut.

about 8 in. from the outside rail on the south or west side of the track and are carefully driven home. Treated and untreated ties are differentiated as before by round and square nail heads. Nail heads are stamped with the last figure of the year in which the tie is laid.

At the end of each month the foreman on an experimental section sends in a report showing ties inserted in and removed from the track during that month. The report form is subdivided so as to classify separately ties taken out and ties put in the main track and the same for side tracks. In every case separate columns are provided for treated and untreated ties under each classification, the number, year mark, kind of wood and kind of treatment being recorded. Under ties removed the foreman reports the reason for removal, whether rotten, broken through accident, burned, rail cut or shattered. If ties are put in on the section on account of new track, a record is made of this fact. The number of tie-plate renewals and new tie-plates placed in the track is also recorded. The foreman notes on this report the number and kind of tie-dating nails he needs, so that he will always have a proper supply on hand.

Ties already in the track but taken up and relaid on another part of the same section are not entered in the monthly report, but if they are taken up and moved for relaying on another section they are entered as removed and relaid in the records of the respective sections. In the latter case the original year mark is preserved and entered in the relaying record, while a note of the transfer is made with the removal record.

Where it is necessary to turn a tie over in relaying, so that the dating nail is on the ground or in a position where it cannot be seen, it is withdrawn and redriven in the regular specified place, where this can be done without defacing it. Otherwise it

Piling for Temporary Trestle From Which High Fill Was Made.

is allowed to remain. When ties are permanently removed and the nail cannot be found after a careful search and scraping of the dirt, an entry of "no mark" is made in the record.

Detailed instructions to section foremen in regard to placing nails and making their records are printed on the back of the monthly report form.

The office record of ties contains a set of sheets for each test section of track, one set embracing a year's records by months, as transferred from the section foreman's reports. In this record ties are classified first by the year of insertion, a subdivision being given to the ties of each year. Under each subdivision notes are made opposite the month in which a removal is made in regard to the kind of wood, treatment, if any, and reason for removal. Each month's record of the ties of any year's insertion shows the total number in the track at the beginning of the month, number inserted, number removed and total in the track at the end of the month. These office sheets also give tabulated reference data on the track of the particular section, covering the miles of first, second, third and fourth main track and side track, with weights of rail, character of ballast and extent of the various kinds, the character of the soil where there is no ballast, number of tie plates under the various classes of rail and a statement of the average cost of tie renewals per tie, subdivided into cost of tie, freight and labor of insertion.

An inspector goes over each test section with the section foreman at frequent intervals to check up the reports made and work done. After a years' trial of this system, those having the work in charge express the opinion that a more accurate record of the life of ties is being obtained by it at less expense than by the former method, where an attempt was made to follow all tie insertions and removals. The records of the life of ties are kept under the direction of Mr. George E. Rex, manager of treating plants of the Atchison, Topeka & Santa Fe Railway System, who instituted the new plan of studying test sections.

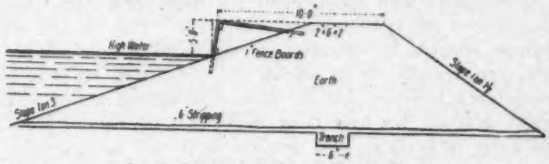
METHODS OF SMALL EARTH DAM CONSTRUCTION, C. & N. W. RY.

A considerable portion of the irrigation of the west has been and will continue to be the work of individual settlers. Two principal ways of irrigating are open to them: pumping from individual wells and impounding local streams. In Wyoming, Montana and the Dakotas and indeed elsewhere through the west the second way will be most common. Impounding the local streams means the construction of dams usually small, usually of earth and nearly always by local labor and without engineering organizations. It is the purpose of this article to summarize briefly certain practice in small earth dam construction, the success of which makes it instructive.

The Chicago & Northwestern, about 1895, began the systematic construction of reservoirs spaced at convenient intervals between its lines and the ranges in Dakota and Wyoming. These reservoirs were intended for cattle watering purposes only, but the construction features employed are quite as well adapted to reservoirs for irrigation. The dams were constructed of earth and experience developed the standard cross-section shown by Fig. 1. This section was an evolution as was also the manner of construction which was specified as follows:

First: The surface of the ground under the entire base of dam inside of the slope stakes, as well as borrow pits, must be stripped for a depth of 6 ins. at least, and more if circumstances require, so as to get rid of all sod and other light and porous material which would prevent the earth in the dam from settling down in a solid and compact manner, and all of the material so removed by stripping must be taken to points which will be outside the reservoir basin when work is completed and to such a distance from the work as to insure there being no liability of any of such material being scraped back into the dam during construction or washed into the reservoir basin by rains, etc., after the same is built.

Second: After the ground under the base of the proposed dam has been stripped and thoroughly cleaned down to good material and before the grading of the dam is otherwise commenced, a trench of 12 ft. in width and not less than 18 ins. in depth, or more when the material is such as to require it, shall be dug the entire length of the proposed dam and so



Cross Section of Small Earth Dam.

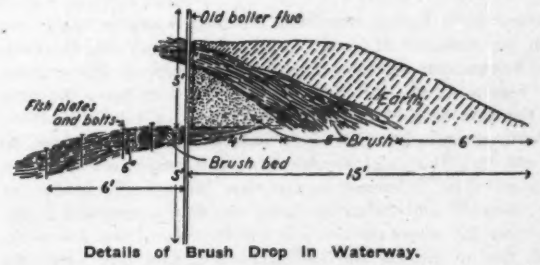
that the edge of the trench nearest the proposed reservoir basin shall not be less than 3 or more than 10 ft. inside of the slope stakes set for the toe of slope on the side next the reservoir basin. This trench is for the purpose of thoroughly breaking the seam that might otherwise exist between the natural ground and the constructed dam, and for that reason should have its sides cut down as nearly perpendicular as practical; and the material from this trench, if of good quality, may be deposited inside the slope stakes in an even and uniform manner along the back side of dam.

Third: When stripping has been thoroughly done and trench completed, the whole surface stripped must be refilled and dam built by grading the material up in a good and uniform manner over the whole base of dam in layers of not more than 24 ins. in thickness and to the slopes as specified.

Fourth: No borrow pits shall be made across the draw below the dam.

Fifth: Unless otherwise authorized by the chief engineer, the slope next the reservoir basin shall be 3 to 1, while that of the back of the dam to be the ordinary slope for dirt banks of 1½ to 1, and dam shall be 10 ft. in width on top. If at any point where a reservoir is to be constructed, the conditions are such as seem to necessitate proceeding differently with any part of the construction than as set forth above, then the reasons for such deviation shall be stated to the chief engineer and his consent obtained.

Sixth: The dam and wasteway shall be located so that the top of the dam will be 5 ft. above the bottom of wasteway. Care should be taken to get a location which will, if possible, admit of a natural wasteway in direct line with the draw above and so that the dam will be located to one



Details of Brush Drop in Waterway.

side, so as not to be subjected to the direct force of the stream.

Seventh: Sketch showing cross section of dam and manner of stripping and making trench is shown in Fig. 1.

Eighth: When the dam is completed, build a wave fence the full length of slope that is reached by the water when reservoir is full, as per plan.

Ninth: Also build a barbed wire fence on iron posts, as per plan furnished, around the outside of toe of slope away from the reservoir, across ends of dam and then parallel with dam, to connect with ends of wave fence.

Tenth: The engineer who stakes out the dam must make an estimate showing cubic yards of material required for dam and wasteway. Also the length of wave fence and protection fence around dam, sending same to the chief engineer as soon as possible after the work is staked out, so that order may be made authorizing the work.

As compared with specifications for large earth dams these specifications are rather general and vague. They do not, for example, stipulate the character of material to be used nor provide very carefully for its placing and compacting. It is to be remembered, however, that the dams contemplated are of small height, generally not over 15 or 16 ft.; that the natural prairie soil alone is available, and that the work will necessarily be done by teams and scrapers, which subject the soil to a fairly thorough compacting in the process of placing it. The construction specified, in a word, is not the ideal but that which may be expected of farmers doing their own work.

nel and some 5 ft. into the bottom. Behind this grid of boiler flues more bundles of brush are placed across channel and for about 10 ft. back as shown by Fig. 2. These cross bundles are then paved or floored on top with another layer of bundles laid butts down stream as shown. These drops proved satisfactory for the limit of their life, which is of course the life of the brush mattresses.

Another feature of these prairie reservoirs is the provision against wave action. The intensity of the wave action which can be developed by winds sweeping across stretches of open prairie is considerable and wave action is perhaps the most destructive of any single agency to which dams of the kind being described are subjected. Four methods of wave protection are employed; ordinary rock pitching of the water slope; rock pitching on a sage brush mat; live willow trees planted on the water slope, and, wave fences. Of these four methods the last is the one most generally adopted. Figure 1 shows the location of the wave fence on the dam section.

The wave fence is a tight bound structure made of say 1x10 in. x 8-ft. boards sharpened and driven like sheet piling into the water slope of the dam so as to stand slightly downstream

TABLE I.—STRUCTURAL AND COST DATA OF RESERVOIRS CONSTRUCTED BY THE CHICAGO AND NORTHWESTERN RAILROAD FOR WATERING STOCK.

Name.	When built	Dam—Max. h'ght. Ft.	Dam—Top l'gth. Ft.	Capacity—Gals.	Capacity—Acre-ft.	Area. Acres.	Aver. depth. Ft.	Original cost. Total.	Per acre-ft.	Cost of maintenance—Total.	Cost of maintenance—Annual.
Casper Creek	1895	13.6	689.0	24,533,500	75.3	21.0	3.6	$1,891.00	$25.11	$3,222.52	$358.06
Powder River	1896	24.1	200.0	3,770,800	11.5	2.5	4.6	782.00	68.60	6.68	.84
East Woolton	1897	16.0	207.0	4,762,500	14.6	3.2	4.6	550.47	37.70	393.21	56.00
Poison Creek	1895	15.3	534.5	19,336,000	59.2	13.5	4.3	1,637.80	27.66	444.43	49.00
Forks	1896	16.0	218.0	4,500,000	13.8	3.1	4.4	470.25	34.08	206.25	25.00
Tisdale	1897	14.0	234.5	4,975,900	15.5	....	...	520.50	33.58	336.50	48.00
Cut Bank	1901	17.5	375.0	6,098,400	18.7	4.7	3.9	1,081.91	57.85	8.40	2.80
Cloud Creek	1903	14.6	259.0	5,880,600	18.0	3.8	4.8	1,251.30	68.41	250.00	250.00
Sage Creek	1896	14.0	259.0	32,413,600	99.2	17.8	5.6	2,287.00	23.05	.....	.....
Lusk	1898	9.0	150.0	2,175,000	6.6	2.0	3.3	85.97	13.03	.....	.....
Duck Creek	1900	12.5	200.0	4,000,000	12.3	3.0	4.1	473.86	38.84	.....	.....
Badwater Creek	1901	14.0	270.0	10,414,400	31.9	8.5	3.8	813.00	25.49	11.75	4.00
Soldier Creek	1904	17.0	319.0	5,880,600	18.0	3.8	4.7	1,009.15	56.06	.....	.....
Crow Creek	1895	10.0	450.0	8,430,800	25.8	5.8	4.5	474.45	18.46	906.43	101.00
Dry Creek	1898	16.0	352.0	2,400,000	7.4	3.8	1.9	371.56	50.21	320.49	53.00
Roundout	1895	12.0	588.6	15,307,400	46.9	10.4	4.5	568.21	12.12	1,553.72	172.00
Box Elder	1895	12.0	403.0	17,154,900	52.7	11.7	4.5	550.00	10.42	1,848.47	205.00
Flying V	1895	12.0	448.0	28,518,200	87.5	19.5	4.5	909.90	10.39	2,263.16	251.00
Cheese Factory	1895	18.0	600.0	23,357,000	71.6	15.9	4.5	1,346.62	18.83	2,793.19	310.00
Montgomery*	1895	12.0	338.0	12,536,300	38.4	8.6	4.4	545.26	14.20	776.29	86.00
Short Creek	1895	10.0	327.0	11,158,000	34.2	7.6	4.5	393.13	11.53	687.75	76.00
Battle Creek*	1895	15.0	950.0	27,697,100	85.0	18.9	4.5	712.25	8.40	2,598.71	288.00
East Cottonwood	1896	20.0	435.0	61,068,500	187.4	53.6	3.5	1,438.00	7.68	475.43	59.00
Corral Creek	1896	14.8	468.0	60,646,500	186.1	53.2	3.5	1,266.00	6.82	745.43	93.00
Bull Creek*	1897	15.5	392.0	8,825,400	27.0	8.0	3.4	657.75	24.36	1,433.35	204.00
Indian Spring*	1895	13.2	345.0	6,192,400	19.0	....	...	407.68	21.57	187.99	21.00
New Indian Spring	1900	15.0	230.0	4,300,000	13.2	2.8	4.7	427.00	32.35	627.87	158.00
North Butte Creek	1895	....	.....	7,800,000	23.9	....	...	1,126.75	47.10	1,317.49	146.00
New Battle Creek	1902	15.3	670.0	10,708,200	32.8	11.5	2.9	1,614.00	49.21	26.15	13.00
New Bull Creek	1903	16.0	400.0	4,000,000	12.2	....	...	719.60	58.99	82.99	83.00
Grouse Creek	1903	16.8	240.0	3,052,700	9.3	5.5	1.7	673.36	72.40	.....	.....

*Abandoned.

These dams having been built for stock watering solely furnish no examples of outlet construction. They do, however, give information regarding waterway construction. The practice has been to fix the bottom of the wasteway 5 ft. below the crest of the dam so as to allow for a depth of 2½ to 3 ft. overflow in emergencies. In width these waterways vary from 50 to 250 ft. The chief trouble had with waterways has been erosion. The difference in elevation between the bottom of the waterway and the stream below the dam necessitates a considerable fall where the two join and the face of this fall works back due to erosion and endangers the dam. A successful method of meeting this difficulty was the construction of brush drops as shown by Fig. 2. The construction was as follows:

The brush is made into bundles or fascines bound with wire. A bed of bundles about 6 ins. thick, is made on the channel bottom by laying parallel with the channel with butt ends upstream. This flowing is then fastened together by means of bolts and fish plates and by wiring. Through the upstream end of this flowing a row of old boiler flues is driven squarely across channel from the vertical. This sheeting is fastened together by two strips of walling of 1x10-in. boards nailed to the back, one line at the top and the other just across the ground. At intervals along the fence inclined braces are set with one end driven into the ground and the other end abutting against the sheeting. The construction described is very simple and very efficient within its life.

The dams described were in most cases built by contract at an average price of 15 cents per cubic yard. Up to 1906 the Chicago & Northwestern had built 31 reservoir dams of the kind being considered. Some of these have been abandoned for one reason or another. Table I gives data relative to these structures as originally built. In this table the figures of maintenance costs are hardly representative of true maintenance charges. Wherever the figures were high, as in case of the first reservoir listed, the high cost has usually been due to rebuilding wave fences destroyed by campers, repairing of embankment trampled by cattle, rebuilding waterways, etc. For irrigation purposes many of these causes of damage would not exist.

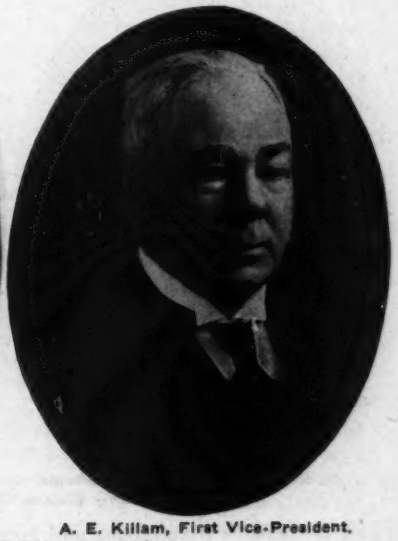
One of the principal causes of deterioration of these small reservoirs has been silting. As examples there may be noted the Butte Creek Reservoir built in 1895 and abandoned in 1902. Originally 10 ft. maximum depth this reservoir had in seven years practically filled with silt or at the rate of 1.4 ft. per year. Montgomery reservoir in seven years accumulated a depth of 7 ft. of silt or 1 ft. per year. Other reservoirs have silted up from 2 to 3 ft. in ten years.—*Engineering and Contracting.*

American Railway Bridge and Building Association

The twenty-first annual convention of the American Railway Bridge and Building Association was held at the Planters Hotel, St. Louis, Mo., on October 17, 18 and 19, 1911. The convention was called to order Tuesday morning by President Rettinghouse, and following the custom of the association the meeting was opened with prayer. As the mayor was compelled to be absent on account of the annual policemen's parade, the address of welcome was delivered by John Gundlach, president of the council, representing the city of St. Louis. He laughingly remarked that the policemen's parade was not caused by the presence of the delegates, but said that he was very glad to see so many ladies present, as the city always felt safer when the ladies were along than when they were not. He urged the members to see St. Louis homes and to learn that it was a good city to live in. Mr. G. W. Andrews, a members of twenty years standing, responded to Mr. Gundlach's remarks and said that inasmuch as the association was first organized in St. Louis, twenty years ago, he always felt that it was a child of St. Louis. In the president's address, which followed, Mr. Rettinghouse in his earnest manner spoke of the good feeling and fellowship which had always existed among the members and said that the association had every reason to feel proud of its growth, the membership having increased from 123 in 1900 to 490 in 1911. He also made note of the fact that in the past members had quite often digressed from the subject under discussion and that during the present session members would not be allowed to wander from the subject. After a short intermission, during which the ladies were allowed to retire, the reports of the secretary, the treasurer and the relief committee were read. These reports were all very satisfactory. Ninety members had been added during the past year, the treasurer reported a balance on hand of $683, and the relief committee, by extending a loan of $100, had saved a large sum of insurance money to the family of a deceased member. The relief committee of this association has done some very commendable work.

F. E. Schall, President.

C. A. Lichty, Secretary.



A. E. Killam, First Vice-President.

Newly Elected Officers of the American Railway Bridge and Building Association.

The first subject taken up was the report of the committee on fireproofing trestle bridges, of which Mr. Lee Jutton was chairman. This was one of the best papers read before the convention and an abstract of it is given elsewhere in this issue. The discussion disclosed the fact that quite a number of different methods are in use and that most of them have met with a fair degree of success. Although the covering of caps and stringers with sheet iron seemed to be used extensively, it brought out many objections because it rendered inspection difficult and because the drippings from refrigerator cars on some roads were the cause of greatly shortening the life of the sheet iron. B. F. Pickering said that on the Boston & Maine they had a double track pile bridge, 275 feet long, with sixty trains a day, which was painted with fire protecting paint. This caused fires to burn so slowly that little damage had ever been done to the bridge, and he recommended this method of fire protection. The use of creosoted ties was mentioned but this affords little or no protection as the creosote burns very readily. Mr. Killam (Intercolonial) spoke of the necessity of trimming off rotten parts of timbers. Mr. Andrews (B. & O.) was in favor of filling in long trestles as the best method of protection, even though the first cost be heavy. Practically all fires start between the rails and the mechanical department was blamed for not keeping ash pans tight.

"Derricks for handling material in supply yards" was taken up during the latter part of the afternoon session and the committee reported that little data had been secured on the use of the derrick for yard use only, although a number of roads had sent information regarding derricks for both yard and road use. The subject was continued for next year's meeting.

The report on "Best methods of numbering bridges," was read by Mr. Jutton, in the absence of the chairman, Mr. Stern. Considerable discussion was indulged in regarding the merits of consecutive and mileage numbering and the difficulties with consecutive numbering when new bridges were inserted. Mr. Pickering (B. & M.) spoke of the difficulties of numbering in the case of two parallel main lines with a large number of connecting and branch lines. Mr. C. H. Fake delivered a short report or "Arrangement of depot platforms," which

was a continuation and addition to a report of last year.

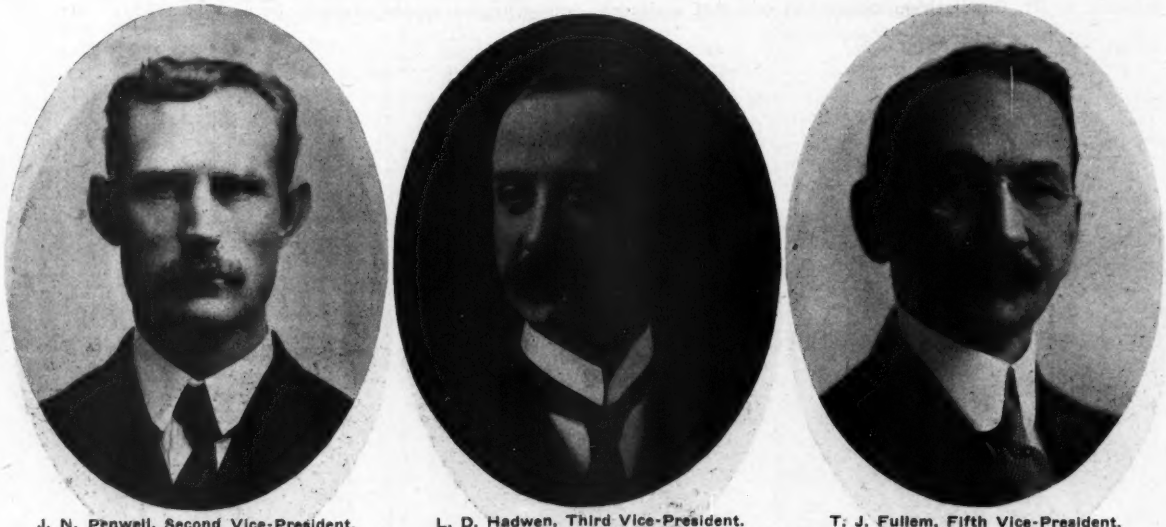
The first report taken up at the Wednesday morning session was that of the committee on "Brick veneer for station buildings," of which M. E. Gumphrey (C., R. I. & P.) was chairman. Just before the report was called for, Mr. Gumphrey received a wire that one of his 500 ft. bridges had had its ties stripped and the report was read by Mr. Jutton. It showed that brick veneer is not considered a great benefit as it costs almost as much as a brick building and this fact was borne out in the discussion which followed. The report was ordered continued over to the next meeting.

A short session was held Tuesday evening and the report on roofs and roof coverings was taken up. This covered the various types of roofing such as gravel, tile, slag, slate and prepared roofings, and the advisability of using certain types for certain slopes. Morris Coburn, chairman of the roofing committee of the American Railway Engineering Association, discussed prepared roofings at some length, saying that in the past it had been difficult to obtain from manufacturers information regarding the various roofings. He gave it as his opinion that the coal tar roofing was in the long run cheaper and better than asphalt roofing. The president called for remarks from roofing men present and Mr. Waddell, of H. W. Johns-Manville Co., took issue with Mr. Coburn, speaking in favor of the asphalt roof. Coal tar pitch, drives out more rapidly than asphalt, and he mentioned asphalt pavements which often have a life of twenty-five years. Mr. Sibley of the Barrett Mfg. Co., gave a short talk on the subject. The committee and subject were continued and the manufacturers present agreed to give it all the assistance possible during the coming year.

Wednesday morning the paper on "Concrete Tank Construction" was read. Although wooden tanks were recommended for temporary use, concrete tanks were favored. The different forms of concrete tanks were described and the fact brought out that concrete lends itself very readily to artistic designs. The discussion concerned chiefly the methods and proportions in the mixing of concrete and of the danger in uniting new and old concrete. At 11:30 the meeting adjourned and members and guests took a trip on a special Missouri Pacific train to a point near Creve Coeur Lake where a demonstration of fire proof paint took place. A trestle 138 feet long had been painted with Clapp's fire proof paint and an engine was run across while the grates were being rocked, thus distributing coals on the bridge ties. A pile of ties at one side had also been coated with the Clapp paint and a very hot fire was kindled under them by igniting a pile of straw. Both tests proved highly successful.

At the afternoon session the paper on pumping engines was read. The report was very short and consisted of a number of tests on various pumpers. The committee had not had time to make tests of certain types of pumpers, and it was continued through the coming year. As the members had just returned from the test mentioned above, the discussion on fireproofing was resumed. A correction to the cost figures given in the paper was made, the cost being about 29 cents per lineal foot instead of 16 cents. White wash was recommended as a preservative and a fire protection. The subject was continued and the committee was instructed to make such tests as they found necessary.

The paper on embankment protection was next in order and took up briefly the various forms such as wire fences, cribs, facine mattresses and broken rock. Mr. A. M. Van Auken, chief engineer of the Memphis, Dallas & Gulf gave it as his opinion that the kind of protection depended entirely on where it was to be used and that the mattress should be carried above the point where the current strikes the bank, an equal distance below this point and also to the center of the river. The cost depended on the width of the stream and the cost of stone and brush. Spur dikes, filled with rocks, if used, must be close enough together so that the eddies will not destroy the dike below. Mr. Killiam of the Intercolonial had put in heavy brush angling down the stream, covering it with heavy rock, and had never had trouble with it. As the committee on bridge and building records made no report, the papers were closed with the above discussion. The report of the obituary committee showed that seven members had passed away during the past year.



J. N. Penwell, Second Vice-President. L. D. Hadwen, Third Vice-President. T. J. Fullem, Fifth Vice-President.
Newly Elected Officers of the American Railway Bridge and Building Association.

The members were greatly handicapped during the discussions because the printed papers were not in their hands until the middle of the second day's meeting. This was not the fault of the hard worked secretary Mr. Lichty, but was due to the fact that the committees did not send their reports in on time and in some cases the reports were in such shape it required considerable work to get them ready for publication.

A variety of entertainment was provided for the ladies, which included a street car trip to University City, a river trip and luncheon, an auto sight-seeing trip, a theatre party and a garden party.

The following officers were elected for the coming year:
Pres., F. E. Schall, L. V., So. Bethlehem, Pa.

1st V. P., A. E. Killam, I. C., Moncton, N. B.
2nd. V. P., J. N. Penwell, L. E. & W., Tipton, Ind.
3rd V. P., L. D. Hadwen, C. M. & St. P., Chicago.
4th V. P., T. J. Fullem, Ill. Cent., Chicago.
Secretary, C. A. Lichty, C. & N. W., Chicago.
Treasurer, J. P. Canty, B. & M., Boston, Mass.

The executive committee is as follows: T. J. Fullem, G. Aldrich, P. Swenson, G. W. Rear, W. O. Eggleston, W. F. Steffens, E. B. Ashby.

The next convention will be held at Baltimore, Md., Oct. 15 to 17, 1912.

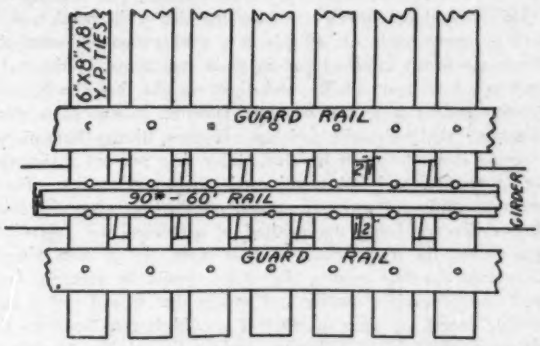
The following supply firms contributed toward the success of the convention by their exhibits:

Allith-Prouty Co., Albion, Mich.; American Hoist & Derrick Co., St. Paul, Minn.; American Valve & Meter Co., Chicago, Ill.; Asphalt Ready Roofing Co., New York City; Barrett Manufacturing Co., New York City; The Philip Carey Co., Lockland, Ohio; Chicago Pneumatic Tool Co., Chicago, Ill.; Detroit Graphite Co., Detroit, Mich.; Paul Dickinson, Inc., Chicago, Ill.; Dixon Crucible Co., Jersey City, N. J.; Eastern Granite Roofing Co., New York City; Fairbanks, Morse & Co., Chicago, Ill.; Forest City Paint & Varnish Co., Cleveland, Ohio; H. W. Johns-Manville, Chicago, Ill.; The Lehon Co., Chicago, Ill.; National Roofing Co., Tonawanda, N. Y.; The Patterson-Sargent Co., Cleveland, Ohio; The W. W. Patterson Co., Pittsburgh, Pa., Rabok Manufacturing Co., St. Louis, Mo.; Railway Age Gazette, New York City; T. W. Snow Construction Co., Chicago, Ill.; Spencer Otis Co., Chicago, Ill.; Standard Asphalt & Rubber Co., Chicago, Ill.; The Texas Co., St. Louis, Mo.; U. S. Wind Engine & Pump Co., Batavia, Ill.

RELAYING CHICAGO ELEVATED LOOP.

Work was started recently by the management of the Chicago Elevated Railways on relaying the rails on the Wabash avenue and Van Buren street sides of the union elevated loop. With the present type of construction 80-lb., 33-ft. rails on 6-in. by 8-in. by 8-in. yellow pine ties, spaced 18 ins. on centers, are used. Under the rails at each of the ties are tie plates. The present structure is noisy, due, in a great measure, to the short length of the rails and the consequent large number of joints, and to the metal surfaces of the rails and the tie plates coming into contact upon the passage of trains and giving out a metallic ring. The new rails are being laid with a view to reduce this noise to a great extent. The rails will be 90-lb., 60-ft. long, of open hearth, high carbon steel, laid directly on the ties and fastened to them by screw spikes. The ties will be placed on 11-in. centers, and as the ties are of the same size as those already in use, the distance between ties will only be 3 ins. The ties were given this short spacing for two reasons, one of which is to deaden the noise and the other is to take care of the rail cutting which would exist to a greater extent with the new type of construction and the old spacing, due to the elimination of the tie plates.

Another feature new in elevated track construction is also being used. This consists of long wooden wedges, tapering from 2 ins. at one end to 1 in. at the other end and having a width equal to the depth of the tie, driven between the ties, as shown in the accompanying sketch. The rails will then rest practically on a wood foundation from one end of the structure to the other, and still leave plenty of open space in the center of the track for drainage. As these wedges become loosened by the jar of the structure, they can be driven firmly into place again. It is expected that with this construction the noise will be deadened as much as is possible with the present type of structure, which is not designed to carry ballast between the rails, such as is used in Philadelphia to deaden the noise. All of the work necessarily has to be done during the night, from 9 o'clock in the evening until 5:30 in the morning, when the traffic is lightest. Trains are rerouted on one track while new rails are being laid on the other track. The tracks over Wabash avenue and Van Buren street will be all that will be relayed this year. Later it is expected to relay the other two sides of the structure. —*Electric Traction Weekly.*



Details of Track Construction on Elevated Loop, Chicago.

FIREPROOFING FOR TIMBER TRESTLES*

This report deals principally with the methods of preventing fires on timber trestles rather than with the methods of extinguishing the fire after it has started. The use of water barrels, etc., will not be considered here, because they do not make a bridge fireproof; they are only agencies by which the fire may be extinguished if some one gets to the bridge in time. What we wish to consider is the manner of constructing timber trestles so that they will not ignite.

Most of the fires on bridges are started by sparks or coals from locomotives although the source of the fire may be entirely foreign to railway equipment. Not many bridges are destroyed by fire from outside sources, and beyond cleaning away vegetation from the vicinity of the bridge it would hardly pay to fireproof for such causes. Fire dropped from locomotives has burned many bridges and almost all such fires can be avoided by the use of a good type of fireproofing.

The question might be raised, "Does it pay to make trestles fireproof?" It is difficult to say just how much loss may result from the burning of a bridge. It will certainly be more than merely the cost of rebuilding the bridge. The greatest loss would be in case of a disastrous train wreck due to a burned bridge. If, however, the fire is discovered before a train may be wrecked, there is the delay to traffic, and the hurried rebuilding of the bridge, which costs considerably more than rebuilding under ordinary conditions.

With the primary object of protecting human lives, the Railway Commissioners of Canada require that railroads fireproof their bridges. They have issued a set of regulations giving several methods which will be accepted by them as sufficient fire protection for timber bridges.

Timber bridges which need fireproofing most are those on high speed lines and those which may be visible to the engineman for only a short distance. The larger the bridge the greater the need of fireproofing.

Types of fireproofing used extensively at the present time are as follows: (a) Ballasted floor pile bridges; about the same amount of ballast being placed under the tie, on the bridge, as on an embankment. (b) Metal covering on the ties. (c) Ballast covering from two to four inches thick on the ties; a wood filler being placed between the ties to support the ballast. (d) Metal covering on the caps and stringers. (e) Metal covering on the ties with two inches of ballast thereon. (f) Ordinary pile bridges built with certain kinds of treated timber. (g) Fire resisting paints. (h) Pile bridges having I-beam stringers.

*Committee report, American Bridge and Building Association.

The fireproof feature of ballasted floor timber trestles is not the most important reason for adopting this type of construction, and the details of such bridges can not properly be considered here except to say that the ballast serves as a first-class fire protection for the timber. These bridges with treated timber cost about 75 per cent more than ordinary pile bridges.

The method of entirely covering the ties with metal is favored by many roads. It affords very good protection when the sheets are firmly attached and in good condition. If the metal used is of a poor quality and light weight, holes will soon develop and if it is not properly fastened it will soon work loose and the ends will curl up. If these things happen the covering is apt to assist ignition rather than prevent it, because the loose ends and holes will catch coals and sparks. There are many different ways of putting on this covering, the principal difference being the method of attaching the galvanized iron around the track rails. In most cases, No. 22 iron is used, To obtain the best results, the metal should be securely fastened and of such a quality and weight that it will last a reasonable length of time, in fact it should last as long as the timber in the bridge. When a good quality of No. 22 galvanized iron is used this type costs about 75 cents per lineal foot, single track bridge.

Ballast covering over the entire deck is another type which affords good protection so long as everything is in good condition and no timber is exposed. Gravel ballast is used in most cases, although stone, slag and clay are also used to a considerable extent. The vibration will cause the ballast to bunch over the more rigid parts of the bridge, leaving some of the ties exposed. A very serious objection is that the ballast holds the moisture which causes the decay of the timber. Clay affords a good protection and can be obtained in almost any locality; it is more stable under vibration than gravel, but it will hold moisture longer than the other materials. The draft of high speed trains tends to remove the ballast covering from the bridge.

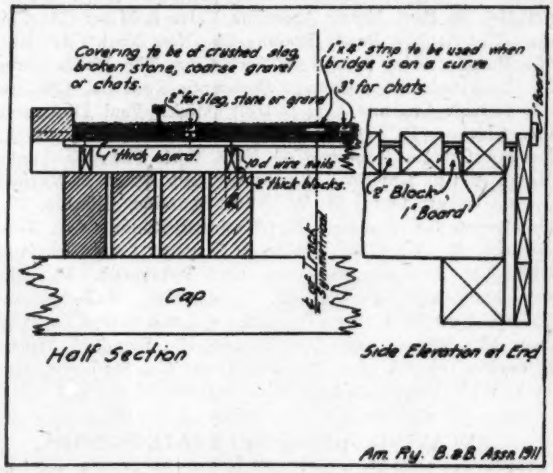
The position of the filler blocks between the ties should be considered. The two extremes are,—placing the filler on the stringers or placing it flush with top of ties. Placing the filler directly on the stringers necessitates a large amount of ballast for covering without gaining anything over a smaller amount as regards fireproofing. The decay of the timber is faster, because the contact surface between ballast and timber is larger, and the larger volume of ballast will hold more moisture. If the filler is placed flush with the top of the ties, the gravel rests on an unbroken surface and will readily move about, due to the vibration of the bridge and the draft of trains, which will leave bare spots. Probably the best way is to place the filler so that it will come about one inch below the top of the tie and then place three inches of ballast on the filler which would provide two inches of ballast above the ties. With gravel ballast such construction costs about 35 cents per lineal foot of single track bridge. Sometimes galvanized iron is placed over the guard rail in connection with the ballast covering. This adds about 15 cents per lineal foot to the cost.

Galvanized iron is placed on the tops of caps and stringers by a number of roads, the object being to protect the timber from weather as well as from fire. In this way the ties are left bare but the more important parts of the bridge are protected. It is not difficult to keep such covering in place. The metal should be of quality and weight sufficient to last as long as the timber. Using a good quality of No. 20 galvanized iron the cost is about 60 cents per lineal foot of single track bridge.

Sometimes a covering of ballast about two inches thick is placed on the metal covering of type B. This partly overcomes some of the objections to this type, in that if some of the edges of the galvanized sheets work loose or holes develop in the metal the presence of the ballast will prevent fire. The draft caused by trains and the vibration of the bridge will cause the ballast to move about and leave bare spots as in type C. Also, the ballast will retain moisture; this is not so serious as in type C, because the ballast does not come in contact with the timber but the moisture will rust the metal. The use of gravel ballast will increase the cost of type B about six cents per lineal foot.

On one road, zinc treated timber was found to be of value in resisting fire. The trestles are built in the usual way and treated timber used. This type probably adds $1.50 per lineal foot to the cost of a pile bridge and it would not pay to use it for the one reason of fireproofing because the cheaper types would afford just as good protection.

Fire resisting paints are used to a considerable extent in the East and in Canada, with good results in most cases. If a paint exists which makes timber absolutely fireproof its employment would certainly be a first-class method of protecting


Covering to be of crushed slag, broken stone, coarse gravel or chats.
1"x4" strip to be used when bridge is on a curve
3" for chats
2" for slag, stone or gravel
4" thick board.
8" thick blocks.
2" Block, 1" Board
Cap
Half Section
Side Elevation at End
Am. Ry. B. & B. Assn. 1911

Crushed Slag for Fireproofing Timber Trestle, C. R. I. & P. Ry.

bridges from fire, provided the paint would not injure the timber in any way. A double track trestle 136 feet long was painted with Clapp's Fire Resisting Paint,—the paint being applied to the top of caps and stringer and top and sides of tie and guard rails. The cost was 16⅛ cents per lineal foot, single track, or 1¼ cents per square foot of area painted. The Board of Railway Commissioners of Canada requires that if Clapp's paint is used, one coat must be applied at least every five years.

The use of I-beams for stringers reduces the probability of fire, although this can hardly be called a method of fireproofing timber trestles. Such construction costs about 20 per cent more than ordinary pile bridges.

Inspection and repairs are made more difficult by the use of types A, B, C, D and E, but with types F, G and H, accessibility to the different parts of the bridge is just as easy as for ordinary pile bridges, hence inspection and repairs are not interfered with.

Inquiries were made of all the important railroads of the United States and Canada, eighty-six in number, as to their practice of fireproofing timber trestles. Replies were received from 73, and out of these, 29 do not use any type of fireproofing.

A summary of the replies from the forty-four railroads which use one or more types, follows:

Chicago, Milwaukee & St. Paul:—Uses gravel covered deck, galvanized iron covered deck and ballasted floor pile bridges. Have had good results in all cases.

Chicago Great Western:—Uses ballasted floor pile bridges and where long spans are necessary I-beams are used for stringers. Formerly used gravel covered deck but this was abandoned.

Chicago & North Western:—Uses galvanized iron covered deck, but to no considerable extent. No. 16 iron is used. Has considered using a gravel covered deck.

Duluth, South Shore & Atlantic:—Uses No. 24 galvanized iron on top of stringers for most bridges; also uses gravel

deck, filled one inch above ties, with 1 inch strip between the ties placed "A" fashion so as to drain to the outside.

Chicago & Alton:—Uses ballasted floor pile bridges.

New York, Chicago & St. Louis:—Uses sheet iron on top of stringers.

Great Northern:—Uses No. 22 galvanized iron on top of ties. Formerly used gravel covering but it was discontinued.

Minneapolis, St. Paul & Sault Ste. Marie:—Uses No. 28 galvanized iron on ties. Also uses crushed stone covering, 5½ inches deep, 3 inches below and 2½ inches above top of ties. Prefers the galvanized iron covering and find that it is cheaper than the crushed stone deck.

Lake Shore & Michigan Southern:—Uses crushed stone deck 2 to 2½ inches deep, placing 3 inch strip between the ties which is flush with top of ties. Has had good results with this method. Also uses ballasted floor pile bridges.

St. Louis & San Francisco:—Uses No. 24 galvanized iron on stringers and caps. Also uses ballasted floor pile bridges.

Northern Pacific:—Formerly used gravel covering, but this was abandoned on account of causing decay of the timber. Uses No. 22 galvanized iron on stringers and caps and No. 22 galvanized iron on top of ties. Also uses ballasted floor pile bridges.

Chicago Rock Island & Pacific:—Uses ballasted floor pile bridges and gravel covered bridges. Gravel covering 3 inches thick,—1 inch below and 2 inches above top of ties; filler, 1 inch thick, between ties. Has had no fires on any of the protected bridges and intend to protect all bridges.

Missouri Pacific:—Uses gravel covering. A filler 3 inches thick is placed between the ties and flush on top with ties. Gravel covering is 2 inches thick.

Illinois Central:—Uses ballasted floor pile bridges. Has had good results with fire resisting paints and with zinc treated timber in pile bridges.

St. Louis Southwestern:—Uses ballasted floor pile bridges and is very careful to keep vegetation and rubbish cleaned away from timber.

Chicago, Indianapolis & Louisville:—Uses ballasted floor pile bridges, and has some bridges on which the stringers are covered with a heavy galvanized iron; good results in both cases.

Chicago, Burlington & Quincy:—Uses No. 22 galvanized iron covering on the ties and sometimes covers this with 2 inches of gravel or cinders. Also uses gravel covering 2 inches thick by placing filler 2 inches in thickness between the ties and flush on top with the ties.

Michigan Central:—Uses ballasted floor pile bridges, creosoted timber, and on these bridges places No. 26 galvanized iron on top and sides of guard rail and on top of the cap where it extends out beyond the outside stringers. Also uses the pile bridges with I-beam stringers and is considering covering the ties on these bridges with galvanized iron, placing 2 inches of gravel on that.

Louisville & Nashville:—Uses ballasted floor pile bridges with creosoted timber and on open floor pile bridges cover the stringers and caps with No. 20 galvanized iron.

Queen & Crescent:—Uses ballasted floor pile bridges and creosoted timber and on ordinary pile bridges place No. 15 sheet iron on tops of stringers and caps; also uses the method of placing this sheet iron on top of ties. Is considering concrete fire walls every few hundred feet, for long trestles.

Wabash R. R.:—Uses gravel covering.

Western Australian Government Railroads:—Use ballasted floor pile bridges. Find that it is very essential to keep dry grasses removed from the vicinity of bridges.

New York, New Haven & Hartford:—Covers stringers, caps and sills with galvanized iron or sheet zinc. Keeps all combustible material away from bridges. On one division, previous to 1880, all timber stringers were heavily coated with lime whitewash every second year, with very good results with regard both to fire prevention and timber preservation.

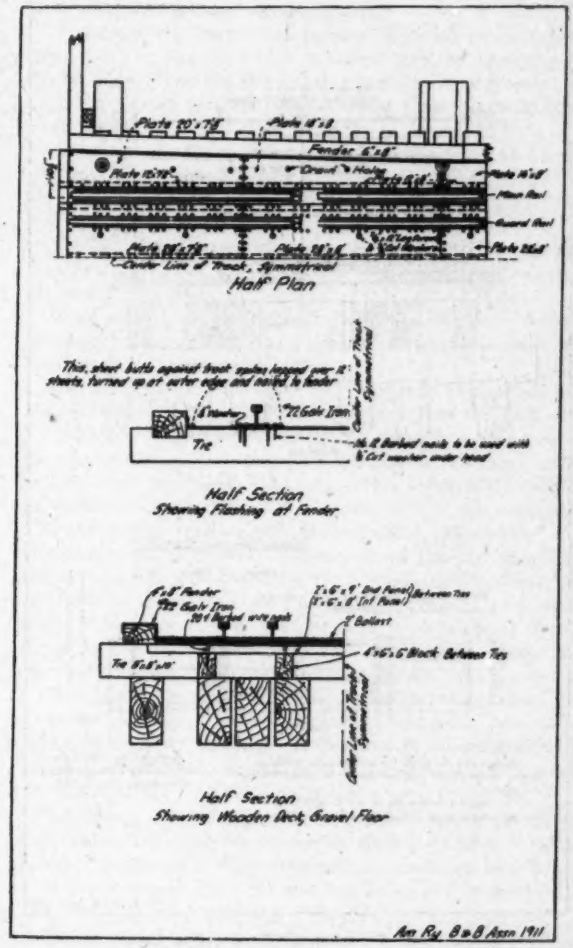
Boston & Albany:—Thin sheet iron is placed over tops of caps and stringers.

Delaware & Hudson:—On its Canadian lines uses Clapp's Fire Resisting Paint, complying with order of the Dominion Government.

Erie R. R.:—Covers stringers and caps with galvanized iron. Uses whitewash to a small extent. Very careful to keep all vegetation cleaned away.

Lehigh Valley:—Has used galvanized iron on stringers.

Maine Central:—Recently has used Clapp's Fire Resisting Paint with such good results that it will now be used on all trestles. Keeps all foreign combustible matter away from the trestles.



Gravel Ballast for Fireproofing Timber Trestle, C. B. & Q. R. R.

Boston & Maine:—Clapp's Fire Resisting Paint applied during warm weather at least once in three years to tops and sides of ties and guard rails and tops of stringers and caps. The entire right of way is kept free from all combustible material for entire length of timber bridges.

Philadelphia & Reading:—Has placed second-hand sheet iron on top of stringers with cross strips about three feet wide on top of ties over each cap. In some cases has covered the ties with sheet iron.

Canadian Pacific:—Has whitewashed tops of stringers and caps. Has tested fire resisting paints with good results.

Baltimore & Ohio:—Has built two or three ballasted floor trestles on Southwest System. Where trestles occur on curves

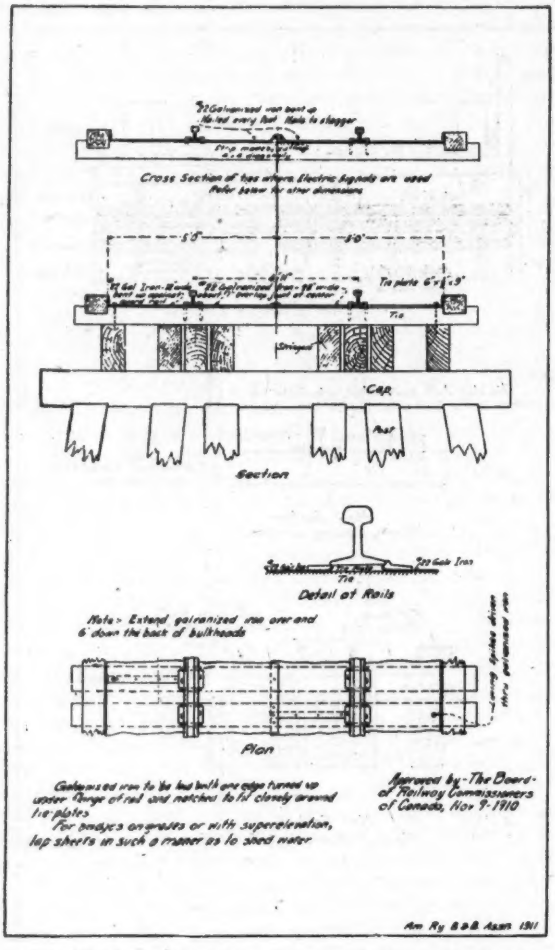
stringers are covered with galvanized iron. Has one bridge covered with gravel.

Mobile & Ohio:—Has ballasted floor pile bridges which are considered the best type, but are considering covering the stringers with galvanized iron or using a fire resisting paint.

Norfolk & Western:—Has one bridge covered with gravel as an experiment. Use a 2 inch filler block and 8 inches of gravel.

Cincinnati, Hamilton & Dayton:—Has used galvanized iron cover on stringers with good results.

Nashville, Chattanooga & St. Louis:—Is using ballasted floor pile bridges. On ordinary pile bridges cover the stringers and caps with No. 22 galvanized iron.


Cross Section of bas where Electric Signals are used
Section
Detail of Rails
Plan
Approved by The Board of Railway Commissioners of Canada, Nov 9 1910
Am Ry S & B Assn 1911

Fireproofing Metal Covering for Fireproofing Timber Trestle.

Southern Ry.:—Is using ballasted floor pile bridges. On ordinary pile bridges cover stringers and caps with galvanized iron.

Seaboard Air Line:—On trestles which can not be seen for a distance of 2,000 ft. in either direction, along the track, the stringers are covered with No. 20 galvanized iron. Also using ballasted floor pile bridges.

Atchison, Topeka & Santa Fe:—Is using galvanized iron on top of stringers and caps; also has some bridges covered with gravel. Ballasted floor pile bridges with creosoted timber are used. Has tried fire resisting paints but this method has been abandoned.

Western Pacific:—Uses gravel covered deck, placing a filler block 2 inches thick between the ties. Gravel covering is 6 inches thick; the lower 4 inches being coarse gravel and the remainder fine gravel. Also has ballasted floor pile bridges.

Oregon Short Line:—Uses gravel covered deck and ballasted floor pile bridges.

Houston & Texas Central:—Reports poor results with fire resisting paints and with metal covering on top of ties or stringers. Is now using gravel covered deck and ballasted floor pile bridges.

Denver & Rio Grande:—Uses gravel covered deck and ballasted floor pile bridges. With the gravel deck, a filler block 4 inches thick is placed between the ties and 9 inches of gravel placed on that.

Cleveland, Cincinnati, Chicago & St. Louis:—In the case of trestles on curves, stringers are covered with galvanized iron; has one bridge on which a timber filler was placed between the ties and the bridge covered with gravel.

Summary Showing the Types of Fireproofing Used on Forty-Four Railroads.

Types Used.	No. of Roads Using.
A	6
B	2
C	3
D	5
G	4
A and D	6
A and H	1
A and C	6
A, B and D	2
A, B and C	1
A, G and F	1
A, C and D	1
B and C	1
B, C and E	1
B and D	1
C and D	2
D and G	1

Summary of Forty-Four Railroads, Showing Number on Which Each Type of Fireproofing is Used.

A	24
B	8
C	15
D	18
E	1
F	1
G	6
H	1

Conclusions.

Most railroads favor the ballasted floor pile bridge because it has many other desirable qualities as well as being fireproof.

The protection of the timber from the weather is probably as much the reason for using type D as the fireproof feature.

Types F and H are used because with them a bridge is more permanent than the ordinary timber trestle, hence does not need so many repairs.

Types B, C, E and G are used solely to protect bridges from fire, and since type E is merely a slight modification of type B there remain only three types used exclusively for fireproofing.

As stated above, with the use of types B and C, inspection and repairs are more difficult to make than ordinarily and this is quite important on timber structures; also when type C is used a more rigid inspection is necessary and more repairs will be needed than otherwise.

Type G is very simple and does not change the general construction of the bridge in any way. Another thing in its favor is the comparatively low cost. There is, however, some doubt as to its effectiveness, but a thorough test made under actual working conditions ought to determine whether a fire resisting paint is practical to use for fireproofing timber trestles.

Personals

J. H. Knowles, division engineer of the Western Pacific at Elko, Nev., has been appointed bridge engineer, with headquarters at San Francisco, Cal.

I. F. Stern, engineer of bridges, Chicago & Northwestern, has resigned to engage in practice as consulting engineer. He will have offices in Old Colony Building, Chicago.

L. W. Smith, signal inspector at Milwaukee, for the Chicago, Milwaukee & St. Paul, has been appointed signal engineer of the Chicago, Milwaukee & Puget Sound, with offices at Tacoma, Wash.

F. Merritt, chief Engineer of the Gulf, Colorado & Santa Fe., office at Galveston, Tex., has had his jurisdiction extended over the Santa Fe Dock & Channel Company.

Marion Morris has been appointed signal supervisor of the Chicago & Alton with office at Marshall, Mo., succeeding J. R. Lyons, resigned.

Chas. E. Roland has been appointed assistant engineer maintenance of way on the Chesapeake & Ohio with office at Covington, Ky.

J. G. Sullivan, formerly assistant chief engineer of the western lines of the Canadian Pacific has been appointed chief engineer of the western lines with office at Winnipeg, Man.

H. R. Safford has been appointed chief engineer of the Grand Trunk, with offices at Montreal, Que. He succeeds H. G. Kelley.

W. H. Tool succeeds E. Brown as master of bridges and buildings of the Grand Trunk with office at Allandale, Ont.

Chas. H. Moore has been appointed principal assistant engineer of the Erie with office at New York City.

D. W. Thrower succeeds G. E. Boyd as roadmaster of the Illinois Central at Chicago. J. L. Downs becomes roadmaster of the Yazoo & Mississippi Valley at Memphis, Tenn., and E. I. Rogers has been appointed roadmaster at Vicksburg, Miss.

G. E. Boyd has been appointed superintendent of bridges and buildings of the Delaware, Lackawanna & Western with office at Scranton, Pa.

F. L. Brooks has been appointed supervisor of bridges and buildings of the Rutland office at Rutland, Vt.

STRUCTURES.

The Atchison, Topeka & Santa Fe Coast Lines will build a 15-stall roundhouse at Riverbank, Cal., to cost approximately $50,000. Work has been started by this company extending and enlarging the wharves and freight sheds at the mole at Ferry point, Richmond, Cal. The cost of the latter work is estimated at $75,000.

According to press reports, plans have been submitted to the city authorities of Ottawa, Ont., for a union passenger station to be built between Canal street and Rideau Canal, opposite the new Grand Trunk station. It is understood that the Canadian Pacific and the Canadian Northern will jointly carry out the work.

According to reports, the Chicago, Rock Island & Pacific is planning the construction of a new bridge at Jefferson in connection with a contemplated spur from the main line of the Chicago & Alton to Jefferson, Mo.

The Chicago, Rock Island & Pacific is preparing plans for a new passenger station at Waurika, Okla.

The Delaware, Lackawanna & Western is to erect a new passenger station and a new freight house at Syracuse, N. Y. The new freight house will occupy the site directly across the tracks from the passenger station, where the old roundhouse and shops stood before the present buildings were erected in the western part of the city.

The Illinois Central is contemplating building a new passenger station at Sturgis, Ky.

The Long Island is shifting the tracks at Arverne, N. Y., preparatory to beginning work on a new station to be built at Vernon avenue.

The Nashville, Chattanooga & St. Louis has let the contract for remodeling and enlarging its freight house and office quarters at Chattanooga, Tenn.

The directors of the New York, New Haven & Hartford have appropriated $200,000 for the preliminary work for the proposed $1,200,000 station at New Haven, Conn. Preliminary to the construction of this station certain streets will have to be discontinued, and the sewers changed, gas pipes laid and electric conduits put in. The grade of Union Avenue will also be raised and pavement laid.

The Northern Pacific has received bids for reconstructing pier No. 1 at Seattle, and it is stated that the contracts will be let soon. The improvements will cost about $60,000.

It is reported that the Oregon Short Line will build a new station, at Jamieson, Ore.

According to press reports the Pennsylvania has given a contract for building a new concrete and steel bridge over the hollow near Craigdell station, above Oakmont, Pa.; estimated cost about $40,000.

The Southern Pacific has given a contract to W. L. Graff, San Francisco, Cal., to put up new stations at Natron, Lowell, and Jasper, Ore.

It is said that the Southern Railway will soon build a station at Delrio, Tenn., to replace the structure which was destroyed by fire some time ago.

The Carolina & Northwestern has just completed new shops, replacing those destroyed by fire July 29, 1910.

Plans are under consideration for erecting a terminal on the site of the present Dearborn St. station, Chicago, which will be used by thirten railroads. This work will probably be decided upon by the various roads within the next year. The cost of the work is estimated at about $30,000,000.

Tentative plans for the construction of the McCallie Ave. viaduct are being prepared by W. J. Watson, Cleveland, O., and will be forwarded to Chattanooga, Tenn., in a short time. A conference will then be held by officials of the C. N. O. & T. P. and Nashville, Chattanooga & St. Louis and city in regard to the actual construction.

The Gulf, Colorado & Santa Fe is preparing plans for a one-story brick passenger station at Cameron, Tex.

The Bellingham & Skagit Interurban in connection with building a line into Mount Vernon, will soon start work erecting a bridge over the Skagit river.

The Kansas City Southern has anounced that it will build a viaduct at the crossing known as Hopkins Curve, 2 miles north of Joplin, Mo. The structure as proposed will be of steel and concrete and will cost approximately $16,000.

The Kansas City Terminal Company has let contracts to the W. P. Carmichael Co., Kansas City, for building a retaining wall east of Brooklyn avenue, and to O'Hagan & Lake Aurora, Ill., for a subway at Independence Road.

The Louisville & Nashville will build a reinforced concrete and brick passenger station, to cost approximately $50,000 at Gulman, Ala. The work will probably be done by company forces.

The Midland Valley has let the contract for building a brick engine house at Wichita, Kan.

The New York Central has filed a petition with the Common Council, Oswego, N. Y., for permission to erect a new bridge across the Oswego River in that city. The work on the structure will probably be started this fall.

It is reported that the Oregon-Washington Railroad & Navigation Co. will soon start work on a bridge over the Snake river, near Clarkston, Wash.

The Signal Department

ANNUAL MEETING, RAILWAY SIGNAL ASSN.

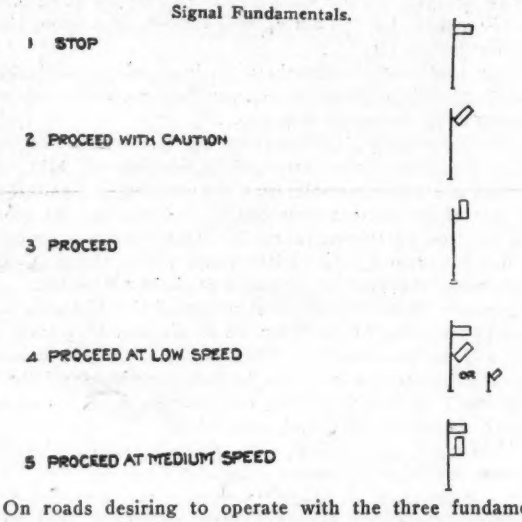
The Railway Signal Association held its sixteenth annual convention in the Antlers Hotel at Colorado Springs, Colo., October 10, 11 and 12.

The opening session, at 10 a. m. Tuesday morning, was called to order by C. E. Denny (signal engineer, L. S. & M. S.), president of the association. An address of welcome was given by Mayor Avery, of Colorado Springs. Mr. Denny, in his opening address, called attention to the size and quality of the advance notice, containing 365 pages, and commended the committees for their work. He also stated that he thought the association should compile a manual of standards.

Signaling Practice and Standards—Committee No. I.

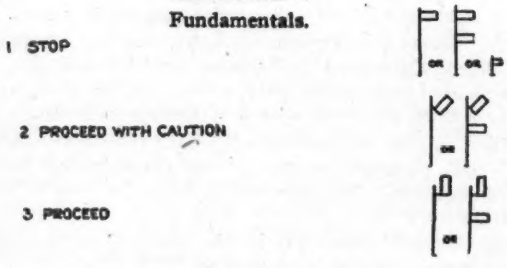
After a careful consideration of the subject we arrive at the following: There are three signals that are essential in operation, and therefore fundamental, viz.: (1) Stop. (2) Proceed with caution. (3) Proceed. Supplementary indications to be used where required: (4) Proceed at low speed. (5) Proceed at medium speed.

Signal Fundamentals.

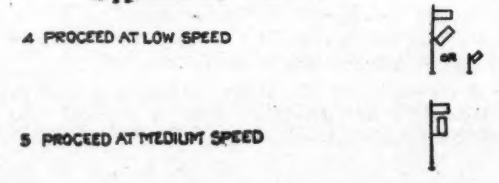


On roads desiring to operate with the three fundamentals and two additional indications without expansion or combination of these indications, the following aspects may be used:

Scheme No. 1.
Fundamentals.



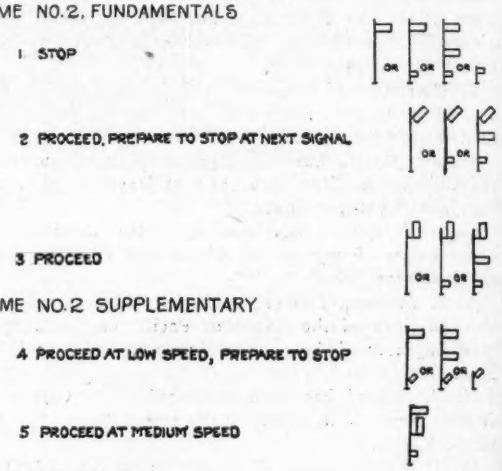
Supplementary Indications.



Conclusion No. 2, Scheme No. 2.

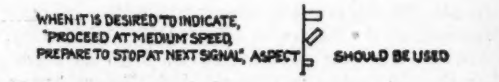
On those roads desiring combinations of the fundamentals and supplementary indications and different aspects for the various caution indications permissible under the ruling of the Committee on Transportation, the following aspects should be used:

SCHEME NO.2, FUNDAMENTALS

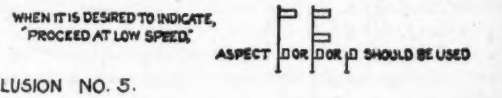


SCHEME NO.2 SUPPLEMENTARY

CONCLUSION NO.3.

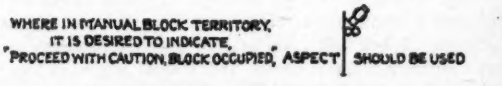


CONCLUSION NO. 4.



CONCLUSION NO. 5.

CONCLUSION NO. 6.



Conclusion No. 7.

The arms of automatic signals should be pointed and the arms of other signals giving stop indications should have square ends; on roads using Scheme No. 1, a number plate should be added on the automatic signal, and on roads using Scheme No. 2 a red marker light should be added below and to the left of the active light.

Conclusion No. 8.

This conclusion contained a recommendation that the following drawings be accepted as standard: 1059A, clamp for base of ground signal masts; 1065A, blades for upper-quadrant signals; 1066A, details and assembly of single vertical crank stands; 1067A, details of multiple vertical crank stands; 1071A, strap pipe carrier; 1072B, assembly of transverse pipe carrier; 1073B, details of transverse pipe carrier; 1082B, semaphore bearing; 1083B, U-bolt and clamp (for lamp bracket); 1090B, filler block (to limit travel of signal arms); 1091B, filler block (to limit travel of signal arms); 1092B, filler block (to prevent travel of signal arms); 1093A, diagram of spectacle clearance; 1094A, pipe insulation (joint); 1096A, plunger lock.

The following drawings were submitted for discussion: 1095A, one-way stand for multiple-unit bolt lock; 1097A, mechanical dwarf signal.

A minority report was submitted by L. R. Clausen (C. M. & St. P.), W. B. Scott (Harriman Lines), T. S. Stevens (A T. & S. F.), and J. C. Young (Union Pacific). This report was not acted upon.

After a long discussion between supporters of the majority and minority reports, the majority report was accepted by the members present send sent out for a letter ballot to other members of the association.

A. H. Rudd made a motion that whereas the new scheme for a uniform system would undoubtedly conflict with many of the present diverse practices but will tend toward eventual uniformity, it is resolved: That the acceptance of the system does not discredit present signal practices which have proven their efficiency; that the proposed schemes may be safely installed in connection with and without changing present systems; that the new system be used in new work and renewals, so that in reasonable time uniformity may be attained. The above motion was passed and will be submitted to a letter ballot.

The standard drawings were adopted as proposed, except for minor changes in the Semaphore Bearing and U Bolt and Clamp. The proposed symbols for signal drawings were adopted as recommended, with the addition of the symbol for a track battery, the letter "B." The specifications for 1-inch wrought iron pipe were adopted. Chairman of committee, A. H. Rudd; vice-chairman, L. R. Clausen.

Mechanical Interlocking—Committee No. II.

This committee was unable to recommend a device to take the place of a bolt lock in mechanical plants with pipe connected units, but they gave four suggestions or conditions that should govern the design of such a lock. The Harmonizing Committee submitted specifications for Portland cement concrete. The recommendations for drawbridges and spans stated that preliminary locking arrangement shall be provided for each of the following purposes before signals can be set at proceed: (a) To prevent application of power for the purpose of operating the bridge, or anything in connection with the bridge; (b) to insure that the bridge is in proper alignment and that the bridge surfacing devices are in their proper positions; (c) to lock each rail in proper position for train movement.

The Harmonizing Committee recommended a number of changes and additions in the general and detail specifications for mechanical interlocking. Chairman of committee, C. J. Kelloway; vice-chairman, F. C. Stuart. Subject (c) and the report of the Harmonizing Committee were accepted and submitted to letter ballot. Subject (a) was referred back, and changes were made in subject (b).

Power Interlocking—Committee III.

Sub-committee "A," W. H. Arkenburgh, chairman, recommended that the following drawings be adopted as standard for both mechanical and power interlocking: Fig. 8, approach and route locking; Fig. 9, approach and route locking; Fig. 12, route locking; Fig. 13, track indicating circuit; Fig. 14, approach locking. Definitions were presented for detector locking, route locking, and approach locking. Recommendations were made for the classification and testing of signal and switch motors.

C. C. Anthony, President. F. P. Patenall, Vice-President. C. C. Rosenberg, Secretary-Treasurer.

Newly Elected Officers of the Railway Signal Association.

Sub-committee "B," F. B. Weigand, chairman, submitted a number of typical circuits, and also investigated and reported on a device used in place of a bolt lock on the Pennsylvania at S Q Tower at Pittsburgh.

Sub-committee "C," I. S. Raymer, chairman, submitted specifications for a petroleum asphaltum suitable for placing around electric conductors in trunking; and also submitted plans for electro-pneumatic interlocking.

Sub-committee "E," W. F. Follett, chairman, submitted a set of specifications for electro-pneumatic interlocking. The Harmonizing Committee proposed a number of changes and additions in the general and detail specifications for power interlocking. Chairman of committee, B. H. Mann; vice-chairman, W. F. Follett.

Discussion.

The five diagrams submitted by sub-committee "A" were accepted and submitted to letter ballot. Sub-committee "B" report on subject (a) was adopted and the report on subject (b) was accepted as a progress report. The report of sub-committee "C" was accepted and referred to letter ballot. The report of sub-committee "E" was approved with a correction in the length of detector bar, which is left blank instead of 53 feet. The Harmonizing Committee's report was approved.

W. H. Higgins, Member of the Executive Committee, Railway Signal Association.

Automatic Block—Committee No. IV.

Committee No. 4 submitted sets of specifications as follows: Specifications for direct current relays, lifting armature neutral type; specifications for impregnation treatment of electro-magnet and other coils and windings used in railway signaling; specifications for hard fibre; specifications for tinned channel pins; specifications for battery cells. Chairman of committee, A. G. Shaver; vice-chairman, J. M. Fitzgerald.

The specifications for impregnated treatment of coils, hard fibre, tinned channel pans, gravity battery zincs, and cross-arms were approved. The plan for a caustic soda battery was approved, but the specifications are to be revised. The specifications for direct current relays are to be revised and reported on next year.

Automatic Stops and Cab Signals—Committee No. VI.

This committee made several investigations of automatic stops and cab signals, notably the Collard-Rohe system, the Unverricht system and the Waldron system. Tests have been witnessed by several members. Most of the work was done by correspondence, as there was but one committee meeting. Chairman of committee, Robt. C. Johnson; vice-chairman, H. K. Lowry. The report of this committee was accepted by the association as progress.

Subjects and Definitions—Committee No. VII.

As Committee III has found it necessary to characterize some of the kinds of electric locking and a request for terms and definitions for various kinds of electric locking was received, the committee chose several new terms which seemed to be needed and prepared definitions of electric locking and six of the varieties, as follows: electric approach locking; electric indication locking; electric route locking; electric section locking; electric sectional route locking; electric stick locking. A number of other words or phrases were defined, among which were "mechanical slot" and "electric slot."

The definitions were approved as presented in the report and were submitted to letter ballot. The ballot was arranged so that the voter could express his disapproval of either the word or the definition. Chairman of committee, W. H. Elliott.

Wires and Cables—Committee No. IX.

This committee recommended that the word "iron" should be struck out of the title and first paragraph of the specifications for B. B. line wire and E. B. B. band wires as confusion had resulted both in the minds of the manufacturers and purchasers. It was recommended that the title of the specifications for rubber-insulated signal wire be changed to "specifications for mineral matter rubber compound insulated signal wire for 660 volts or less." Specifications were submitted for lead covered cable, underground braided cables for current of 660 volts or less, lead covered cable for 2,200 volts service, copper-clad steel bond wires and hard-drawn copper-clad steel line wire for 30 per cent conductivity. Chairman of committee, W. H. Elliott; vice-chairman, E. L. Adams.

The changes recommended and the specifications were adopted, except those relating to copper-clad steel bond wires and copper-clad steel line wire.

Electric Signaling for Electric Railways—Committee No. X.

This committee was instructed as follows: (a) Continue investigation, and make further report of the various systems in satisfactory operation: (b) Prepare specifications for a. c. operated automatic signal installations on electric railways. This committee was divided into 8 sub-committees, which reported as follows:

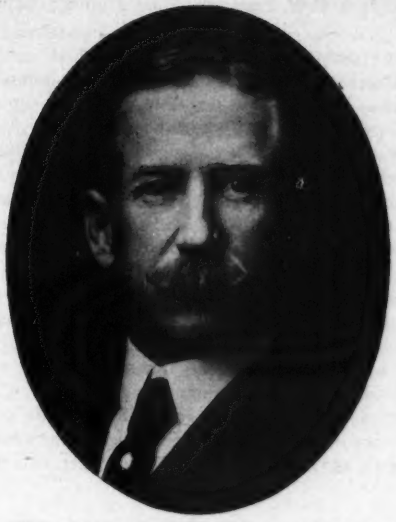
Sub-committee "C" submitted an historical report dealing with alternating current track circuits with alternating current signal control, and alternating current track circuits with direct current signal control, on steam or non-electrified lines. The installations reported on are located at: Washington, D. C., Pennsylvania R. R.; A. T. Junction to Holliday, Kan., A. T. & S. F.; Cottonwood to Daggett, Cal., A. T. & S. F.; Harrisburg to Mason-Dixon, Pa., Cumberland Valley.

Sub-committee "D" reported on installaions of alternating current track circuits with alternating current signal control on interurban lines, the Kinsman alternating current system on trolley lines, and jointless alternating current track circuits. The following installation was described: Port Byron to Auburn, N. Y., Auburn & Northern Electric Ry., and Syracuse, Lake Shore & Northern Ry. No report was made on the Kinsman block system, as sufficient data was not available. The sub-committee reported no new developments in Jointless Track Circuits.

Sub-committee "E" was instructed to submit a report on alternating current signal installations with alternating current propulsion. The Boston & Maine Hoosac Tunnel electrification was described.

Sub-committee "F" deferred the report on the Pennsyl-

M. E. Smith, Member of the Executive Committee, Railway Signal Association.



George Boyce, Member of the Executive Committee, Railway Signal Association.

vania Terminal electrification, New York city, an alternating current signal system with direct current propulsion.

Sub-committee "G" reported on the signal installation of the Illinos Traction system.

Sub-committee "A" was instructed to suggest an outline for an alternating current system where alternating current is used for propulsion, and this committee drew up and submitted a wiring diagram as their recommendation.

Sub-committee "H" was instructed to supply a description of all three position alternating current relays, not previously treated on in literature of this committee. The report of this sub-committee described the General Railway Signal Company's universal polyphase (4 way) relay.

Sub-committee "B" submitted lists showing requisites of apparatus and material for signals, relays, alternating current supply and distribution, circuit controllers, bonding materials, electrical conductors, wire conduits, insulations, instrument shelters, line fixtures, switch indicators, electric locks, junction terminals, lightning arresters, number plates and numbers, locks, signal lanterns and lamp boxes, concrete and paint.

Discussion.

The reports of sub-committee "A" and sub-committee "B" were adopted. The remainder of the report was accepted as information.

Manual—Committee No. XI.

This committee reported that, on account of being out of date, the following should not be printed in the manual: special papers; symbols and nomenclature; rules for operation and maintenance of interlocking; signal department organization.

It was recommended that material classed under the following main headings should be incorporated in the manual: signal indications; mechanical interlocking specification; electric interlocking specifications; electro-pneumatic specifications; automatic block signal (specification); standard designs and material. Chairman of committee, F. P. Patenall.

The association accepted the committee's recommendation with the exception of the third principle of signal indications (which is included under Signal Indications) viz: "Two lights of full intensity shall be displayed on every high speed signal."

Contracts—Committee No. XII.

This committee was instructed to (a) Submit a contract form for joint interlocking plants, and to (b) Submit a recommendation for the division of expense of construction, operation and maintenance of joint interlocking plants. The work of the committee was divided as follows: Section 1. Selection of the general cases where a standard form of agreement is necessary or desirable. Section 2. Discussion of form the standard agreement should take and enumeration of the various points to be covered. Section 3. Discussion of and approval of principles to be followed in determining the division of expenses and responsibilities of the parties to a standard agreement. Section 4. The preparation of statements or outlines showing the actual division of expense and responsibilities which are to be used in drawing up the standard agreements. Section 5. The drawing up of proposed standard agreements for each of the three general classes heretofore selected. The committee reported on sections 1, 2, 3 and 4, but not on 5.

The committee discussed the above points as they affect three conditions: (a) Provision for new crossing and plant where there is no existing crossing or plant; (b) Existing crossing and no existing plant where (1) no crossing agreement is in effect, (2) an old crossing agreement is in effect, or (3) a new railway is crossing at or near a present crossing not interlocked; (c) Existing crossing and existing plant where it is desired to (1) enlarge or reduce for one or more than one party, (2) enlarge or rearrange for a new line joining or crossing. Chairman of committee, L. R. Clausen.

The report of the committee was accepted as information.

Storage Battery—Special Committee.

The instructions were (a) Continue the standardization of parts and accessories of storage cells: (b) Prepare specifications for portable cells; (c) Investigate and report on designs for housing storage batteries for interlocking and automatic signal work. The committee reported specifications for portable cells of the all-lead type, and submitted plans and specifications covering this type of battery. These specifications cover capacity of battery, number of cells per battery, number of cells per carrying case, weight per case, and method of assembly. Chairman of committee, A. H. Yocum.

The report was adopted by the convention.

Methods of Recording Signal Failures—Special Committee.

The outline work prescribed for this committee was as follows: "Reconsider forms submitted at the last annual meeting, paying particular attention to the points discussed, and secure information, if possible, from roads using the

G. S. Pflasterer, Member of the Executive Committee, Railway Signal Association.

reports submitted, making a complete report at the annual meeting."

So far as the committee was able to learn, the forms submitted last year have not been used by any roads, and it was therefore impossible to procure any information, based on actual experience, regarding the results obtained from their use. These forms have, however, been carefully reconsidered, and the committee recommended in their stead seven forms, viz: R. S. A.—1, to be filled in by Engineman or Conductor; R. S. A.—2, to be filled in by Dispatcher; R. S. A.—3, to be filled in by Operator for notifying signal department of delays; R. S. A.—4, to be filled in by Maintainer to report cause of failure; R. S. A.—5, to be filled in and kept for permanent record in the office of the Signal Engineer; R. S. A.—6, to be used by Supervisors for showing comparisons and stimulating competition; R. S. A.—7, to be filled in each month by Signal Engineer for presentation to superior officers. Chairman of committee, J. C. Young; vice-chairman, H. W. Lewis.

The report was discussed and referred back to the committee with the thanks of the association.

Promotion of Signaling Education—Special Committee.

The work of the committee last year, which was to be continued, was: (a) Index printed matter relating to signaling; (b) Report on colleges; (c) Report on correspondence schools; (d) Report on educational methods of various railroads.

Progress was reported on subject (a); in connection with subject (b), committee stated it was working on an outline of an engineering college course to be given students expecting to follow signal engineering after graduation. Under subject (c) the committee confined its report to the School of Railway Signaling at Utica, N. Y. Under subject (d) the committee reported on educational methods of 38 railways. Chairman of committee, W. J. Eck.

This report was accepted with minor changes.

Election of Officers.

The election of officers resulted as follows:

President, C. C. Anthony, assistant signal engineer, Pennsylvania R. R.

Vice-president, F. P. Patenall, signal engineer, Baltimore & Ohio.

Secretary-treasurer, C. C. Rosenberg.

Newly elected members of the executive committee:

George Boyce, superintendent telegraph and signals, Chicago, St. Paul, Minnapolis & Omaha.

W. H. Higgins, supervisor of signals, Central Railroad of New Jersey.

G. S. Pflasterer, signal engineer, Nashville, Chattanooga & St. Louis.

M. E. Smith, signal engineer, Delaware, Lackawanna & Western.

The nominating committee:

J. B. Latimer, signal engineer, Chicago, Burlington & Quincy.

H. W. Lewis, signal engineer, Lehigh Valley.

W. A. Hough, signal draftsman, Erie R. R.

Thos. G. Hyatt, signal foreman, Wabash R. R.

The choices of a meeting place for next year's convention were Quebec and Atlantic City, in the order named.

ANNUAL MEETING OF THE SIGNAL APPLIANCE ASSOCIATION.

The following officers were elected at the meeting of the Signal Appliance Association.

Chairman, H. M. Buck, Railroad Supply Co., New York.

Vice-chairman, W. J. Gillingham, Jr., Hall Signal Co., Chicago.

Treasurer, H. M. Sperry, General Railway Signal Co., Rochester, N. Y.

Secretary, F. W. Edmunds, Dressel Railway Lamp Works, New York.

Members of the executive committee were elected as follows:

W. H. Baldwin, Adams & Westlake Co., Chicago.

P. Hawley, United States Light & Heating Co., New York.

L. G. Martin, Okonite Co., New York.

L. Thomas, General Railway Signal Co., Chicago.

The Maintenance of Way Department

PRIZES FOR MAINTENANCE ON THE PENNSYLVANIA.

Fifty-four hundred dollars as prizes for maintaining sections of track in the best condition during the past year were recently awarded by the Pennsylvania to supervisors and assistant supervisors. General manager Long, with a party of about 200 operating officers of the Pennsylvania, left Pittsburg on the annual inspection, and the prizes were awarded upon the arrival of the inspection party at Harrisburg, Pa.

The first prize, amounting to $800 for the supervisor and $400 for the assistant supervisor, awarded for maintaining the best section of track throughout the past year, was presented to C. M. Wisman, supervisor, and William F. Miller, assistant supervisor, who nad charge of the track between Tullytown, Pa., and Deans, N. J. The other prizes were as follows:

Four premiums of $800, $600 for the supervisor and $200 for the assistant, for the best line and surface on a main line superintendent's division between New York and Pittsburg and Philadelphia and Washington:

John Schimmel, Jr., supervisor, H. A. Gass, assistant supervisor, in charge of track from Woodbine Avenue, West Philadelphia, to west of Coatesville.

D. T. Easby, supervisor, R. S. Stewart, assistant supervisor, in charge of track from the east end of the Rockville Bridge to east of Thompsontown, Pa.

George Ehrenfeld, supervisor, G. W. Curtiss, assistant supervisor, in charge of track from the west end of Altoona Yard to east of Portage, on which is located the "Horse-Shoe Curve."

George Goldie, Jr., supervisor, N. D. Vernon, assistant supervisor, in charge of track between Sixty-second Street, West Philadelphia, and Wilmington, Del.

A special improvement premium of $1,000, $700 to the supervisor and $300 to the assistant, for the greatest improvement made in the line and surface of a supervisor's section of track was awarded to F. W. L. Schneider, supervisor, and F. M. Robb, assistant supervisor, who have charge of the track between Huntington and Altoona Yard, Pa.

These awards were made upon the basis of frequent inspections during the past year by a special committee composed of Joseph T. Richards, chief engineer of maintenance of way, chairman; L. R. Zollinger, engineer of maintenance of way; Elisha Lee, assistant to the general manager; J. B. Baker, superintendent of the Philadelphia terminal division, and E. B. John, superintendent of the Delaware division.

Among the methods used to learn the exact condition of the "line and surface" of the main lines was to place glasses of water on the sills of windows on each side of the special the floor of the car which recorded the jolts of the train inspection car at the end of a running train. Every "spill" of water occurring on each supervisor's section was carefully recorded as a demerit. There was also a machine on from side to side and up and down. These records formed the basis on which the committee decided the prize awards.

SURFACING.

Editor Engineering:

In making high raises with surfacing gang, we do not require very careful work and perfect service for the reason that on high raises track will not hold line and surface and it is necessary to resurface and line the track. By requiring less careful work a greater distance is covered each day by the extra gang. The resurfacing and lining can be taken care of by a smaller crew following the extra gang.

The size of the organization depends largely upon the kind of ballast handled, whether stone, gravel or cinders, and also upon the traffic. On stone ballast under heavy traffic on high raises no less than 60 men should be used in the gang as time is saved when making run-offs for regular trains. On gravel or cinder ballast gangs of 30 men under light traffic are usually sufficient to take care of the work and all traffic can usually be slowed down on approaching the ballasting which also will assist in the amount of work accomplished by the gang.

Div. Engr., N. Y. C. & H. R.

Editor Engineering:

When making a high raise with a surfacing gang, I do not require a careful and perfect surface on the first raise. I have them to carry a good uniform surface and then after making the raise have the track re-surfaced, tamped and dressed up.

I advocate greater speed by surfacing gang, and smoothing track by section men behind the surfacing gang. I consider that 20 men make a good surfacing gang.

Roadmaster, M. & O.

Editor Engineering:

In making a high raise, say 10 to 14 ins., with surfacing gang, track should be left smooth enough for a speed of 35 to 40 miles per hour. This gang should remove all decayed ties replacing them with new ones when making high raise. A gang of 30 to 35 men should follow up with about a 2 or 3-in. surface, putting track in perfect surface, line and gauge and trim up, leaving the section gang to follow up tightening bolts and burning the old ties.

I advocate speed with first gang making high raise and replacing decayed ties. I fear an ordinary section gang would be unable to follow a large gang smoothing and trimming up and take care of their regular repair work and give satisfactory results. The best size and organization for a surfacing gang making a high raise is a good competent foreman with one good assistant and 50 men.

General Roadmaster, G. T.

Editor Engineering:

I require very careful work when surfacing, and in using spot board always raise a little high, allowing for the track to settle. I always require my extra gangs to complete the work that they do, no matter whether it is surfacing or putting in ties, as it has always been a great drawback for extra gangs to half do a piece of work and then section foreman have to go over the work and do it again.

An organized gang of about 40 men is a good size crew for surfacing, and a foreman that can handle his men can carry on and complete the work of surfacing as he goes. I believe that railroad companies ought to get out of this thing of having extra gangs to go on various divisions in order to help section foremen out. and let them rush over and leave the track in worse shape than they found it as far as surface and line is concerned. I don't see any use in spending money on an extra gang if you don't require them to do first-class work in all instances.

Roadmaster, M. K. & T.

Editor Engineering:

It is not our custom when we make a high lift with surfacing gang to do very careful work and bring the track to a perfect surface. We generally intend to leave it enough higher than the finished grade to allow for settlement. After it has been run over a few days we follow along with a large section crew or other surfacing gang and bring it up to a finished surface, after which it is taken care of by regular section crew. In ballasting we generally use a crew of about 35 men who take care of the output from one steam shovel with two trains hauling to them, delivering in the vicinity of 1,000 to 1,200 yards per day.

Roadmaster, B. & M.

MAINTENANCE OF ROADWAY AND TRACK

The importance of maintaining roadway and track in a perfect condition should be fully realized by all employes in the Maintenance of Way Department. Only where track is kept in first class condition is it possible to operate trains with the speed, comfort, and safety necessary to meet the requirements of the traveling public.

Whatever work is necessary to maintain track in first-class condition may be systematized so that various duties can be regularly attended to at certain seasons of the year, although the maintenance work to be done, the order in which the various duties should be performed, and the minor details of carrying out the work may vary considerably according to the facilities, the condition of the track, the amount of traffic, and the climatic conditions of the section of country under consideration.

Maintenance of roadway and track consists of the various kinds of work necessary to keep the track in standard condition. Work on maintenance of track should begin as early in the spring as possible, after all frost is out of the ground.

In track work, the first thing a track foreman should do in the spring is to carefully examine his entire outfit of tools to see that they are in proper condition for use. Picks and bars should be sharpened, levels and gages tested, and such tools as are found beyond repair or unfit for further use should be turned over to the supply car or sent to the general storekeeper. The track foreman must know what equipment he needs, sufficiently in advance of the time such tools are required for use, and make a requisition so that it can be filled before the articles called for will be required.

In the early spring the men should be put to work opening waterways where the snow is melting, so that all water will be carried from the track as rapidly as possible. Places where track has heaved during the winter should be constantly watched at this time, for unequal conditions of surface will become more frequent and troublesome on account of the frost leaving the ground more rapidly on the south side of fills and on the north side of cuts than on the opposite sides. When all frost has left the ground and all water from melting snow and ice has been led from the roadway, work on restoring track to proper surface should commence.

Shimming.

Heaving of track is caused by the freezing and consequent expansion of the water which is absorbed and retained by the earth and ballast of which the roadway is composed. Gravelly or sandy soils in the roadbed insure better drainage and less heaving of track, but the roadbed is often composed of soils that are not of such a formation as to permit the best drainage. The amount of heaving to be contended with is therefore governed by conditions which cannot altogether be overcome, and resort is had to "shimming" as a means of maintaining as good a surface as possible.

Shimming track is a makeshift method of preserving surface under conditions which cannot always be prevented. It

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*A bulletin issued by the Bureau of Education, Chicago Great Western Railroad.

should not be resorted to unless unavoidable; but, as it is often impossible to maintain fair surface otherwise, an allowable method of shimmnig track is described below.

Shims are usually square pieces of hard wood of varying thicknesses and of a square dimension about the same as that of the tie-plates. They have holes bored through them so that the spikes may be driven without splitting the shim. When used they should be placed upon the ties, under the tie-plates where used.

As track begins to heave the rise is gradual, and when first noticed a "run-off" should be shimmed on each side of the high points for a distance of about twenty feet in each direction, using at the starting point a common standard shim one-eighth inch in thickness and a shim one-eighth inch thicker on each succeeding tie until the surface has been equalized as much as possible. This may require the use of shims one inch thick finally, *but in no case should shimming in this manner exceed one inch.* No attempt should be made to compensate for heaving by adzing the ties, for they would soon be completely cut away.

Track has a tendency to spread when shimmed to a height of one inch. The shims may slip on the tie and go with the rail giving no support to those portions of the spike which extend above the tie. To avoid this, rail braces should be properly and securely placed against the head of the rail. It must be remembered that the thicker the shim the less of the spike is in the tie, and the weaker the power of the spike to hold the rails in place. Owing to this, the lateral thrust of trains has greater opportunity to bend the spikes and tilt the rails, thereby causing a widening of the gage. Wherever necessary, longer spikes should be used to secure better holding power.

There are occasions when the use of shims of unusual or uncommon thickness is imperative. Before resorting to this extreme, other methods should be tried, especially if the heaving is only over a spot a few feet in extent. In such a case, even with frost in the ground, it may be found expedient and preferable to dig the high spot down rather than shim a run-off from it. Or, as the frost frequently leaves the surface to a considerable depth at intervals during the winter, a more satisfactory correction of surface may be secured by digging down some at these points when freezing weather ceases for several days.

The places where extreme shimming may be required are encountered with greater frequency where frost has gone deeper into the roadbed than elsewhere, and where for some reason water has been allowed to accumulate. These places often heave to such an extent that shimming as much as four inches may be necessary. In these cases shimming can be done with the least risk of danger if the following method is used.

When shims over an inch thick are used, they should be about two feet long, and should have holes bored to receive boat-spikes or large nails for retaining them in a fixed position on the tie. This will permit the use of thinner shims on top, the same as on the tie, using the standard tie-plate on top of the upper shim. When it is necessary to shim over 1¼ in., a 2-in. plank, the same length and about the same width as the tie, can be used, by extending it across the track under the rails and spiking it to the tie with boat-spikes or large nails. Continuing in this manner, a 3 or 4 in plank may be used finally, if necessary. Shims should never be used on bridges.

It will be found that track rarely or never returns to the original level which prevailed before heaving commenced, either during thaws or after the frost has all left the ground. A very important part of the track-foreman's work during the thaws and while the frost is finally leaving the ground, is to remove the shimming from the track as necessary, in the reverse order in which it was placed—not all at one time but by successive stages. Instead of raising and tamping the low places between any two easements caused by the frost leaving the ground, the large plank and shims can be successively replaced by smaller ones, thus keeping the track in fair surface and so gradually restoring it to a normal condition. The planks which were used for shimming will not be damaged to any extent, and may be used for other purposes. Other shims in serviceable condition should be neatly piled inside of the tool houses and saved for use the following winter. Each time spikes are drawn when removing shims, the old spike-holes should be plugged and the spikes redriven in the plugged hole as often as good holding power can be secured in this way; otherwise a tie on which much shimming has been done will be completely destroyed by "spike-killing" in a very short time.

When the track foreman has succeeded in freeing the road-bed from all surface water, and as soon as all frost is out of the ground, the most important work to be done is to remove all the remaining shims in the track. When the track has not returned to its original level and shims are still necessary to keep track in surface, it must be dug down to proper level, the shims removed, and a fair surfacing secured in this way rather than by attempting to raise the long intervening sections to the level of high points, and all ties that may have been disturbed in resurfacing these places in the track must be solidly tamped to furnish a firm support for the rails. Places where extreme heaving has taken place should be carefully watched, as rails are liable to break at these places if proper attention is not given them. All shims removed should be taken to tool houses and carefully stored inside for future use.

When through with the work of removing shims from the track the section should be gone over and the worst of the low places, joints, etc., should be picked up and as good a general surface given to the track as is possible without needless delay. The general line of track should always be watched while attending to the surfacing and no points should be allowed to remain out of line.

The first general attention given to the track when removing shims and picking up the worst low spots should include tightening up all bolts, redriving spikes where necessary, cleaning up ditches, trimming up road crossings, and such rough repairs to cattle-guards, fences, roadway-signs, etc., as will put them in serviceable condition until systematic and thorough attention is given to the track later in the season. This preliminary attention should also cover such work as may be required to straighten up telegraph poles, to examine side tracks, and make light repairs, and to clean up from yards and station grounds the accumulated rubbish of winter.

Renewing Ties.

An estimate of the number of ties needed for renewals is made during the late fall or early winter. This should be done by the supervisor of track, and the track-foreman, who should make a trip over the section together and mark all ties which are to be taken from the track. All ties that are to be used for renewals should have been distributed for use where needed by the time the frost has left the ground, so that the ties will be on the ground ready to place in the track at the earliest opportunity for making renewals. Track-foremen should mark each tie with chalk or keel to show line representing the line side of track. This will prevent loss of time and will always be the means of having the tie go into the track with the proper side or face exposed.

Tie renewals should be made by beginning at one end of the section and continuing through to the other end as soon and with as much regularity as possible, always full-spiking, maintaining surface and line where the track is disturbed in making renewals, and tamping all new ties to a solid bearing under the rails. Although ties should be tamped throughout their length, they should not be tamped to a firmer bearing in the center than under the rails. Doing

this causes what is known as "center-bound" track, and if the tamping at the center of ties is firmer than at the ends, the track will "rock" on this center when trains pass over it, thereby destroying line and surface. If the work of renewing ties is properly carried on, it should be completed by the first of July leaving the late summer and fall free for the maintenance work required to put track in first-class condition to go through the winter. When all tie-renewals have been made, general surfacing, lining, and other maintenance work should be systematically carried out.

Surfacing.

Beginning at one end surfacing should be carried through the entire section, the work being done out of face. Main-line track should be the first to receive attention, following which side-track may be attended to in the same manner. The track-level and gage should be used constantly when surfacing track, so as to insure that corrections of surface are made systematically and not by a "hit-or-miss" method. While through long practice the eye may be trained sufficiently to locate and correct a single low spot, it can hardly be depended upon to correct many in succession with such accuracy as will leave the track in perfect surface over long distances. Therefore, where so many irregularities exist that practically all track must be surfaced more or less, the better methods is to use the spot board and sighting-blocks on the high places or places previously brought to grade, and raise the intermediate places to proper surface.

No more raise should be given to track when correcting surface than to bring low portions up to the high spots or to the standard grade. If there is sufficient ballast under the track it is only a waste of material and labor to give track a greater raise than is necessary to secure a good surface. Track has more chance to settle and to so acquire an uneven surface where a high raise has been made, than where the greater portion of the road-bed has been left undisturbed, and where only as much new ballast is placed as can be firmly compacted by using a tamping pick or tamping-bar. The solidity of the road-bed depends upon how well the new ballast has been tamped under the ties, and how little the old ballast in the track has been disturbed.

There are other reasons why the track should not be raised more than one or two inches when surfacing, where sufficient ballast is already under the ties. Jacks will cause track to bulge out of line if set in a slightly inclined position; and as general surfacing is carried on during the hot summer months, while the steel is expanding, the jacks, though set originally in a vertical position, will have the strain of the expanding steel imposed upon them, causing them to lean slightly and so pull or allow the track to kick out of line—the amount being more or less dependent upon how much of a raise is being made and consequently how much the track is deprived of the resistance afforded by the ballast at the shoulder of the track.

Before any raising is done, all spikes should be driven down snug against the rail so that after raising it will not be necessary to hold loose ties up against the rails while tamping. All spikes should be pulled from ties which are to be replaced, so that such ties will remain undisturbed while the track is being raised. If this is not done, the ballast will run under them and make it necessary to do needless digging. Where these methods are followed it is not necessary to disturb the ballast at the shoulder in any way except at the end of such ties as are to come out of the track; and if the shoulders of the track are preserved intact, track has less tendency to get out of line.

Where surfacing must be done by using the spot-board the aim should be to raise track just enough to clear the high spots. This will provide for a slight settlement and will result in a good final surface. (This refers to surfacing short stretches of track, and not to surfacing done out of face where grade-stakes are set as a guide). The spot-board should be placed directly over one of the high points at right angles with the track, which should have been properly leveled. When the spot-board has been properly placed and leveled, the jack should be put in position at the first joint to be raised. One of the blocks used to sight over should be placed on the rail where the jack is being used, and another block should be placed over the next joint back which has previously been leveled. Sighting over this latter block and across the one at the jack to the black line on the spot-board, watch the block on the joint being raised until it shows up just a trifle above the direct line of sight. This trifling excess of raise is an allowance made for settlement of track when it is dropped on the fresh tamping. Just how much to allow for this settlement depends largely upon the kind of ballast, but in ordinary practice the allowance should be small, and experience under varying conditions will furnish the correct guide. No such allowance for settlement should be made when surfacing out of face, for the track if properly tamped will settle uniformly. Where the spot-board is placed some 300 feet from the point of sighting, a point at or about the center of the black stripe may be used for sighting. If the spot-board is used at closer range a lower point of sight should be used. Trackmen should never raise the general surface of track unnecessarily. This practice is not only wasteful of ballast, but deprives the track of the effectiveness of a full shoulder at the ends of ties.

After the joint has been raised and tamped to proper height, the jack should be placed at the point directly opposite on the parallel rail. This may be at a joint or center, depending on whether the track has been laid with joints staggered (opposite centers) or opposite each other. This point should now be raised to the same height as the opposite rail, using the track level. When both rails are at a perfect level at these points, the jack should be taken back to the center of the rail and a sight made along the ball of the rail from such a position that the inside edge of the ball can be used as a guide for sighting to check the surface while raising the center. Much skill is required to do this and constant care should be exercised to insure that the mistake is not made of raising centers above joints. Even a small amount of raise at center above the level of joints is detrimental to track, the principal objection being that it causes a rocking motion of trains, and where joints are opposite centers, it throws the weight of trains on the joints and hammers them still lower, rapidly destroying surface and line. Before starting to raise another rail-length, quarters on the rails just raised should be examined, as it often happens that these points are lower than centers or joints; however, where as heavy as 85-lb. rail is used, low quarters are less frequent than where lighter weights of rail are employed. Centers and quarters can usually be brought to level by sighting along the rail without sighting blocks after joints have been raised to level. On tangents, grade-stakes if set should be placed at intervals of 100 ft.

All curves over two degrees should be provided with spirals at the ends, and these will be laid out by the engineer maintenance of way, according to standards. Elevation stakes will also be provided, indicating the curvature and amount of elevation of curve. A certain amount of elevation is required in the outer rail of curves, the amount depending upon several conditions, of which train speed is the most important. In general, and as a matter of safety, the preference should be given to fast passenger traffic. The outer rail of curves will be given such elevation as the engineer of maintenance of way will direct, the amount to be governed by the location, and with reference to speed, grades and other conditions. Wherever it is practicable, the full elevation should be given throughout the entire length of simple curves, and the run-off made upon the tangents at the rate of one-half inch of elevation for each rail-length (33 ft.) of distance. On standard spiraled curves the track must

be level at the point of spiral and the elevation must be brought up regularly in the length of the spiral to full elevation at the point where the main curve begins.

On reverse curves the track should be level at the point of reverse and full elevations secured each way by raising the outer rail at the rate of one-half inch for each 33 ft. of distance. In case of compound curves (other than spirals), the full elevation must be given throughout the length of the curve having the greater degree of curvature. The elevation should then be reduced at the rate of one-half inch for each 33 ft. of distance until the proper elevation is attained for the curve of lesser degree. If a tangent between reverse curves is too short to provide for the length of run-off, the tangent must be divided into two parts in proportion to the degrees of curvature which it connects, the greater part being next to the curve of greater degree. The track should be level at this division point and the run-off should be brought up each way from the point, at the rate of one-half inch for each 33 ft. of distance, as much of the curve being used as is necessary for that purpose. The inner rail of track must be maintained at grade, and the proper curve elevation must be obtained by raising the outer rail.

On curves track is raised in a manner similar to that followed on tangents, except that the spot-board instead of being leveled over both rails, is placed level with and over the outer rail of the curve, and over the high points in the track. The track level is made adjustable by having a stem or staff at one end so that it can be set for a certain elevation in inches. In using the level to secure the proper elevation of curves, place the seat of this stem or staff on the inner rail, which should be at correct grade, and the bottom of the other end of the level on the outer rail. The level should always be carefully examined each time it is used to make certain that it is in perfect adjustment.

Surfacing track on curves is quite a different proposition from similar work on tangents. Since all curves of two degrees or over should conform to a spiral at the point of curve, the easement should start at this point. For example, consider a 4-deg. curve. From the beginning of the curve (or point of curve), to the end of the first chord is the first degree of curvature; from this point to the end of the next chord is the second degree of curvature; and so on. The stakes on these spirals should be set 30 ft. apart (a chord length), one stake on each side of the track, and should give the proper elevation of the spiral until the full curvature of the curve is reached. At this point only one stake should be set, and it should be on the inside of the track, set to the grade of the inside rail. The spot-board is placed across the track resting on the first two stakes, jacks are placed under both rails and the track raised so that the ball of each rail will touch the bottom of the spot-board after tamping is done and the jacks removed. The spot-board is then moved to the next two stakes and the same methods followed. The jacks are then taken to centers, and the necessary raising is done at these points to secure uniform surface, which is checked by sighting along the balls of the rails. These operations are repeated until the point of full curvature (marked by the single stake before mentioned) is reached. The level is then rested upon this stake and the inner rail leveled and the outer rail brought to proper elevation.

Where extensive raising has to be done, a larger gang than the regular section gang is usually employed. Such a gang should be systematically organized so that one set of men will not get too far ahead of the set following, nor lag so as to keep the following gang waiting. There should be two or three men placed to handle each jack, and two men to tamp at each jack. Two gangs of tampers working in pairs, should tamp alternate rail-lengths of track at the ends of ties, and these gangs should consist of a sufficient number of men to keep ahead of the tampers working on the inside of the track. Enough men using claw-bars should be set to work in advance of the jacks, pulling spikes from the ties that are to be removed for renewal. Two men are usually sufficient for this work. Several men, between the jacks and first gang of tampers, should work at placing new ties and one man should be detailed to the work of marking the rails for the proper spacing of ties. For this purpose a stick 22¾ ins. long is used and chalk marks are made on the flange of the rail to indicate the center of the tie. There should be two men in front of the tampers spacing ties in accordance with these chalk marks.

A gang organized as above will, when properly distributed, have plenty to keep them busy and by careful watching and proper placing will progress without many delays. A rule may be furnished which would give the exact number of men required in a gang of this kind and just how they should be placed. But as gangs are frequently decreased in size after starting work, it is often necessary to disregard a rule and reorganize the remaining forces to the best advantage. A surfacing gang of thirty men should have a foreman and one assistant foreman; one foreman to take charge of the raising, and the other to have charge of the lining, gaging, and general work in the rear, such as full-spiking, tightening up bolts, sorting and piling old material, etc.

To be Continued.

RAILWAY CONSTRUCTION.

According to reports the Atchison, Topeka & Santa Fe. has under consideration plans for building a 180-mile line from El Paso, Tex., east to Pecos, on the Pecos River R. R., and it is understood that the line may eventually be continued further east to the Sterling City branch, at Sterling City, an additional 160 miles.

The Butte, Boise & San Francisco will soon start construction work, it is said, from Butte, Mont., southwest through Montana and Idaho.

After two years' negotiation the Canadian Pacific, Canadian Northern and Grand Trunk Pacific have agreed on the purchase of 215 acres in St. Boniface, across the river from Winnipeg, on which they will build stock yards, abbatoirs and cold storage warehouses at a cost of $5,000,000. The Manitoba Government will aid with $250,000.

The Canadian Northern has called for bids on 40 miles of railway on Vancouver Island, to complete the present program of the Canadian Northern system in that part of the country. It is announced that a direct railway from Winnipeg, Man., to Hudson Bay, along the east shore of Lake Winnipeg, will be built soon by this company and that the government of Manitoba will give the necesssary support to insure construction.

The Central Arkansas & Eastern began the operation of trains into Little Rock on Oct. 22. This road extends from England to Stuttgart, a distance of 27 miles, and from Stuttgart to Hazen, a distance of 20 miles.

An ordinance has been introduced at the meeting of the city council of Cleveland to grant the Cleveland & Youngstown right-of-way to enter that city with a four-track tunnel to a new terminal station, to be built at Ontario street and Prospect avenue. This company was organized several months ago to construct a steam or electric line in the state of Ohio, and it was understood that it would form the connecting link between Cleveland and Youngstown as an extension of the Youngstown lines of the Public Railway and Light Company, which has recently secured control of the Mahoning valley lines.

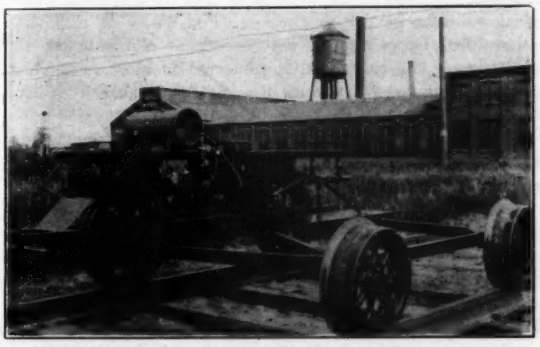
Surveys have just started for the proposed line of the Eastern Maine. Frederick Danforth, Bangor, Me., chief engineer.

With The Manufacturers

NEW POWER CAR.

A new velocipede motor car has been put on the market by the Concrete Form & Engine Company, Detroit, Mich. This company manufactures the well known Belle Isle motors which have been used very successfully on velocipedes and section hand cars. These motors are sold direct from the factory to the men operating the cars, who install them themselves. The construction of the engine permits its being easily applied to all cars of standard construction; and this arrangement enables the purchaser to secure a substantial and satisfactory power car at a reasonable price, but necessitates the inconvenience of installing the engine on the truck.

The demand for a completed power car equipped with a Belle Isle engine grew to such proportions that the Concrete Form & Engine Company has made arrangements with



Concrete Form and Engine Co.'s New Motor Car.

the Kalamazoo Railway Supply Company, makers of railway equipment, whereby customers are now furnished a power velocipede, complete and ready to run.

The marketing of this new car is handled by the Concrete Form & Engine Company. One of their No. 3 cars is shown in the illustration and gives a good idea of the attractiveness of its design. The engine is fitted with an automobile type of carburetor which allows complete control over the speed of the car.

While these power cars are strongly and carefully made, they are still light enough to be easily handled by one man and at the same time have a carrying capacity for three passengers in addition to a large tray for carrying tools, supplies, etc.

IMPROVED CUBE CONCRETE MIXER.

A great advantage of the Improved Cube Mixer is that the batch is treated throughout as a unit. Every movement of the cubical box—in other words, every mixing motion—is conveyed to the whole batch. Not a minute particle escapes this action. The breaker rods are the only obstructions inside the cube and they do not in any way interfere with the unit movement of the mass. The whole batch is shifted each time, and six times in each revolution—a criss-cross motion.

The mixing is done by kneading and not by stirring. The movement of the concrete is in the direction of the plane of rotation of the cube. The batch is folded over on itself and pressed into a contracting space shaped alternately like a wedge and like a pyramid. The whole batch is folded and pressed into the shape of a wedge six times and folded and pressed into the shape of a pyramid six times for each revolution of the cube.

Almost any concrete looks good in the wheelbarrows, but in a test great variations in strength will be found. One of the reasons for this is that nearly all crushed stone, unless washed, is coated with a thin film of very fine dry dust. Nearly all gravel contains more or less clay or loam with which the coarser parts are covered. This dust, or coating of clay, must be ground away and the clean stone laid bare before the cement can get in actual contact with it. In the cube mixer the batch is kept in one mass and the entire weight of the whole rests on the lower particles. As the entire batch is always in motion, each particle is constantly rubbing against some other particle as the mass is folded and refolded upon itself, and there is a great crushing, grinding and kneading of the ingredients until every pebble or piece of stone is perfectly smeared with a coating of cement paste that is ground and squeezed into intimate contact with a clean, solid surface.

One of the most serious obstacles encountered in the manufacture of concrete building blocks is the inability with ordinary facilities to produce concrete that is proof against moisture. One reason for this is that the voids in the stone can be filled with cement no one has yet found a way to fill the voids in the cement. As there is no finer material with which to fill these voids, the next best thing is to find a method by means of which their percentage can be reduced, and the only way in which this can be done is by grinding the cement still finer while wet, and during the process of mixing it with sand and stone. In the cube mixer the mass is always in motion, each particle constantly rubbing against some other particle as the alternating angles of the six sides of the cube fold and refold the batch upon itself, and the cement is pulverized and kneaded into a pasty mixture in which there are few voids.

A special type of charging elevator is furnished with the mixer. This elevator eliminates manual labor and it is claimed may save a large amount on a single contract where a platform and runways would have to be moved frequently.

The elevator consists of a double track, or guides, set at an angle and firmly attached to the mixer frame and requiring no other support. On this track is mounted a traveling carriage and a bucket of sufficient capacity to hold an entire batch. The bucket is filled within twelve inches of the ground and drawn to the top by a cable wound on a hoisting drum, which is also attached to the mixer frame; the operation of the hoist, attending of the engine, and the charging and discharging of the mixer are all performed by one man. When it is desired to elevate the bucket, or hopper, the hoist is started and the bucket rocks over until guide flanges on either side engage the supporting rails of the carriage; and in this position it is carried perfectly erect to the top of the elevator, when the door in the bottom is released, instantly discharging the entire batch into the mixer. The hopper is then immediately lowered to the ground to be refilled while the batch is being mixed, and since the mixer is in constant operation and the charging and returning of the bucket to the ground require but a moment, no time is wasted. All the heavy work of elevating the material is done by the machine and consequently fewer men are required. The concrete mixer charging elevator is made entirely of steel, and is unusually strong, neat in appearance and so light that it can be moved readily from place to place without dismantling a single part.

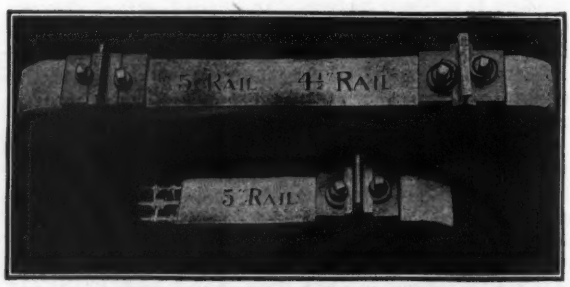
The following railways have purchased and are using Improved Cube Mixers: Chicago, Milwaukee & St. Paul Ry.; Kansas City, Mexico & Orient R. R.; Florida East Coast Ry.; Copper Range R. R.; Tennessee Coal, Iron & R. R.; Van-

dalia R. R.; Ulster & Delaware R. R.; Pennsylvania R. R.; Philippine R. R.; Chicago, Milwaukee Electric R. R.; Chicago & Joliet R. R.; American Railway; Lake Erie & Western Ry.; Erie R. R.; Lexington R. R.; Denver & Rio Grande R. R.; Big Four R. R.; N. Y. C. & H. R. R. R.; N. C. & St L. Ry.; B. & O. Ry.; Norfolk & Western R. R.; Michigan Central R. R.; Detroit & Toledo Shore Ry.; Illinois Central Ry., and Chicago, Burlington & Quincy Ry.

The Chicago Improved Cube Mixer is manufactured by the Municipal Engineering & Contracting Co., Railway Exchange, Chicago, Ill.

PERCIVAL CONCRETE TIE.

We illustrate herewith the Percival concrete tie, a safety device, for the exploitation of which the Universal Concrete Tie Co. has just been organized in New Orleans. The construction of these ties absolutely prevents anything shaking loose. They secure a track so permanent and reliable that there is no comparison between them and other ties. The details of the spiking device and the peculiar "V" shape of the base of the tie in the center insures perfect gauge and obviates spreading of the rails, or center-bound track.



Percival Concrete Tie.

The use to which these ties have already been subjected demonstrates the fact that with these in the roadbed, rail spreading would be practically impossible. They can be manufactured by common labor along the line of the railroads, thus rendering the companies more independent, as they can always have a supply of ties on hand.

The heavy hardwood cushions give resiliency and cause no more injury to the rolling stock than wood ties; these blocks last for six to fifteen years, and are then almost instantly removed by the loosening of the screw spikes by one man. The concrete portion of the Percival tie improves with age. It has withstood every test to which subjected, under various trunk lines, during five years past.

The use of concrete ties will obviate the necessity of installing expensive tie treating plants. The spiking device consists of but four parts to each tie, a device which can practically never work loose, and which gives maximum safety with minimum inspection and maintenance.

The "V" shaped center of the tie reduces the amount of concrete per tie, and thus greatly reduces the weight. The latter is a very important item as a concrete tie of the same size and shape as the standard wooden tie would be excessively heavy and expensive to install and after being installed would make track lifting difficult. The "V" shaped center it is claimed, cannot become center bound, and thus practically no tensile strains are induced along the upper face in the center of the tie.

Percival concrete ties are manufactured and sold by the Universal Concrete Tie Co., 1408-9 Whitney Central Building, New Orleans, La.

CARSON BURGESS CAB SIGNAL AND AUTOMATIC STOP.

The Carson Burgess cab signal and automatic stop is designed to give the engineer a visible signal, the cab signal, indicating danger (red light) caution (green light), or clear (white light). Any other combination of lights may be used at the option of the purchaser. Each time the caution or danger signal is shown, a bell is caused to ring to attract the attention of the engineer. If the stop signal is not obeyed, the brakes will be set automatically by a controlling release valve.

The whole system is controlled by track circuits and no contact rail is necessary. The different operations are accomplished by means of standard electric and mechanical devices, thereby making it unnecessary to design and construct special apparatus. The system has been designed with a view of using as few electrical circuits as possible, thereby decreasing the number of wires, and, with a small number of devices, making as simple a system as possible.

The great advantage in having the signal in the cab, compared with the exposed semaphore signal, is that it is so close to the engineer that he has no excuse for making a mistake in the indications, and the ringing of the bell calls his attention when the signal indicates danger or caution. Fog, snow or rain storms, extinguished lights etc., do not obscure or eliminate the signal from view. The cab signal is protected from storms, which if severe may damage the exposed signal, and cause it to become inoperative.

Whenever any of the apparatus is out of order, the circuit which operates the cab signals will be broken, and the signal will automatically come to the "danger" indication.

In addition to the lamps and bell there is located in the cab an automatic air valve, which is also a part of the system. It works in the "train line," and operates in the absence of an electric current. Any break in the electrical circuit causes the brakes to be set. This valve is one of the main features of the system, because through it the automatic stopping of the train is made possible and while it works conjointly with the signal lamps, it also operates independently of them. So if the lamps are broken or in any other way out of working condition, the valve will automatically stop the train if there is a danger condition.

There is also placed in the cab a "proceed button" which will permit the engineer to proceed with caution toward the danger point if he is so ordered, but only as long as he holds the proceed button closed. When the button is released the train again comes to a stop, and the "proceed" signal is not shown as long as there is danger ahead.

It is said that the system described will work without interference with any automatic block system in use on the railroads today, if it is desired to leave the older system in for a period while determining the usefulness and reliability of the cab system.

The claims put forth for the Carson Burgess automatic cab signal and stop are: (1) Prevents head or rear end collisons. (2) Prevents collisions with cars not in the clear on sidings. (3) Prevents trains running into an open switch. (4) Gives warning of broken rails. (5) Is unaffected by ice, sleet or snow. (6) Is simple and inexpensive to install.

The Carson-Burgess Electro-Automatic signal system is owned and controlled by the International Automatic Signal Co., Kansas City, Mo., with a branch office in Chicago, Ill.

ASBESTOS ROOFING.

By H. C. Dare.

The satisfactory result of building construction is dependable to a great degree upon wearing, fire and water proof qualities and up-keep of roofing. The selection of a roofing which will not be too expensive in price, and yet wear for years without painting or graveling and furnish absolute protection against fire and climatic conditions, has always been a study of considerable moment to engineers and con-

tractors. The list of roofing materials manufactured is a long one, and some of them embrace excellent features. Men experienced in roofing problems look upon asbestos roofing as a natural protection against all destructive elements because it is made of a natural mineral that has already proved to be practically indestructible by not being injured by exposure to the elements for centuries; and the wearing and elastic qualities of the material are not deteriorated in processes of manufacture, or preparation for roofing uses.

The asbestos used in roofings made by the H. W. Johns-Manville Co., New York, is procured in mines owned by the company, at Danville, P. Q., and the fibre is specially prepared by its own experts and by its own particular process.

According to the "J-M" process several layers or sheets of asbestos (Stone) felt are inseparably cemented together with genuine Trinidad Lake asphalt—the same asphalt used for street paving. This makes an all-mineral roofing that is shown to be practically as permanent as the brick walls or any other inorganic part of a building by the fact that it is still in good condition in many buildings after more than a quarter century of service.

Fire cannot get through an asbestos roof from the surface; and from underneath, only after the sheathing boards and timbers have burned away and allowed them to fall, the roofing being carried with them. The saturated and cementing oils cannot be drawn from "J-M" asbestos roofing by the heat of the sun, therefore it retains the waterproofing oils indefinitely. In a test which was recently made, the intense flame of a blow-torch was held on a piece of this roofing for nearly an hour without burning or injuring the roofing any more than to blacken it.

Owing to the increasing demand for a cool roof, the white surface "J-M" asbestos roof is especially valuable where comparatively low summer temperatures are desired on the inside of the building. An actual test made at a large Cleveland, Ohio, clothing factory in the summer of 1908, showed a difference of eighteen degrees between a black and a white surface roof, the thermometers being suspended four feet below the under side of the roof.

"J-M" asbestos roofing is designed either for use over boards or concrete. While formerly asbestos roofings were laid with copper flashings, by the "J-M" process the entire roof including flashings and gutters can be laid with the asbestos roofing.

New Literature

The Ingersoll-Rand Co., 11 Broadway, New York, has issued bulletin 3210, "Compressors," descriptive of Class NE-1 power driven, single stage, straight line, air compressors. This compressor consists of an air cylinder supported by a main frame with a piston operated by means of a center crank shaft with a belt wheel on one side and a fly wheel on the other. Shaft and wheels can be reversed in the bearings if the bell wheel is preferred on the other side. The catalog shows several views of the machine in section and gives tables of sizes and capacities.

* * *

The Columbia Nut & Bolt Co., Bridgeport, Conn., has issued a small booklet describing the principles which operate to hold the Columbia nut tightly locked. Illustrations and diagrams are given with a detailed description of the device.

* * *

"How to Increase the Efficiency of Your Night Shift" is the title of a catalogue issued by the Pyle-National Headlight Co., McCormick Building, Chicago. This catalogue describes its system of stationery equipment for lighting construction, making the work of the night shift more efficient. A number of reproductions are shown from photographs which were taken at night with no light except that furnished by the Pyle-National electric light.

The Oshkosh Mfg. Company in catalogue number 20 describes and illustrates an extensive line of railway, lineman and logging tools. Among the railway tools are: a double grip car mover, the McMicken patented car wheel holder, engine push poles, and timber and tie hooks.

The Jos. F. Kiesler Company, Chicago, issues a booklet describing its extensive line of clam shell, orange peel, and scraper buckets, which are suited for handling ore, coal, coke, sand, crushed stone, gravel, cinders, clay or other heavy material. These buckets are also adapted to dredging. The first few pages in the front of the book are given over to illustrations of the different types accompanied by descriptions. In the remainder of the book there is a large number of excellent illustrations of these buckets in operation, giving the location and class of work being done. A number of testimonials from satisfied users are shown. The catalogue is very neatly gotten up and presents an attractive appearance.

* * *

Hayes Track Appliance Co., Richmond, Ind., has issued a pamphlet illustrating and describing its double end derail. This is a combination of a right and a left hand derail and will derail in either direction.

Industrial Notes

Walter R. Burrows has resigned his position of manager of the railway department of Topping Brothers, New York, and will make and sell Burrows jacks on his own account, with office at 150 Chambers street, New York.

The American Railway Supply Company, 24 Park place, New York, is planning to build a two-story brick factory building, 51 ft. x 87 ft. in area, for the manufacture of brass tags and badges. The company will move its equipment from its present quarters, but will need a new steam engine and boiler.

The Lake Shore & Michigan Southern has found the telephone satisfactory for dispatching and orders have been placed with the Western Electric Company for enough of its selectors to equip five new circuits.

The main offices of A. Eugene Michel and staff, advertising engineers, have been moved into the Park Row building, 21 Park Row, New York, where larger space has been secured, as necessitated by constantly increasing business. Temporarily the photo retouching and illustrating department will remain in the Hudson Terminal building, but all business will be managed from the new offices.

The Moore Continuous Safety Rail Co., Galesburg, Ill., has been incorporated to manufacture and deal in railroad supplies, machinery, etc. The incorporators are: R. D. Moore, L. W. Sanborn, E. R. Drake, W. E. Doyle and R. C. Rice. Capital, $20,000.

The Westinghouse Air Brake Co. has let contracts for its buildings at Emeryville, Cal., and it is expected that some shop equipment will be installed, but so far no definite inquiry has been issued.

The Stotts Railway Signal Co. is negotiating with a view to procuring a site for the establishment of a branch at Niagara Falls, Ont., Canada.

The International Automatic Signal Co., Kansas City, Mo., will manufacture an electric cab signal with an automatic stop, which can be used in connection with the present interlocking and block signals. A branch office will also be opened in Chicago early in November.

Recent Engineering and Maintenance of Way Patents

PATENTS.

TRACK-LAYING MACHINE.

1,006,488—Creed Leon, Nacogdoches, Tex.

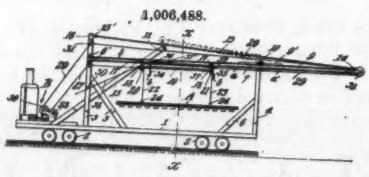
This machine consists of a portable platform on which is mounted a framework carrier consisting of two I-beams, one of them rigidly connected to the framework and the other hingedly connected to form a continuous beam with the stationary beam; a hoisting carriage is designed to travel upon the beams; a pair of flexible cables is disposed upon the carriage and each provided with engaging devices at their lower ends; a hoisting apparatus is mounted upon the platform; a single cable is attached to both cables and to the hoisting apparatus, whereby the cables are operated simultaneously.

PLASTIC TIE.

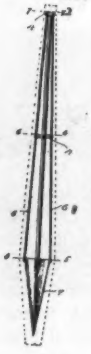
1,006,492—D. K. McDaniel, Stewarts Point, Cal.

A plastic tie including an elongated body being laterally curved between its ends and having registering wings at its opposite sides and adjacent to its ends; tie rods are positioned in the body for reinforcing the same; supporting plates engage across the ends of the body and over the wings and have inturned flanges engaging beneath the wings and embedded in the body. Clamping pins engage through the supporting plates and wings, and wedge-shape keys are carried in the lower ends of the clamping pins for adjustable engagement against the lower sides of the wings.

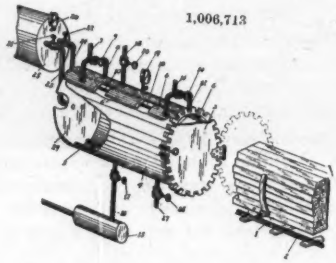
1,006,488.



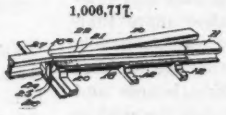
1,006,718



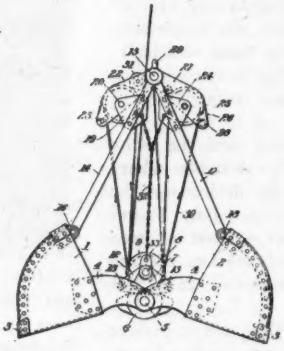
1,006,713



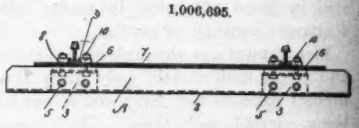
1,006,717.



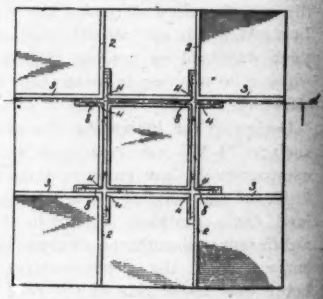
1,007,023



1,006,695.



1,007,024.



RAIL SPLICE.

1,006,604—G. E. Thackray, Westmont Borough, Pa.

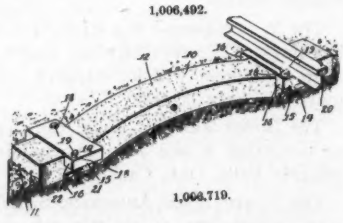
A rail splice comprising splice bars having concavities with sloping sides extending externally lengthwise thereof and provided with holes, track bolts inserted within the holes and provided with clamping members having bearing surfaces beveled to conform accurately to and fit accurately within the concavities after tightening; the inner faces of such clamping members are then in full and uniform contact with the concavities, the splice bars being stiff and rigid in a transverse direction so as not to bend in that direction when the bolts are tightened.

CONCRETE POST MOLD.

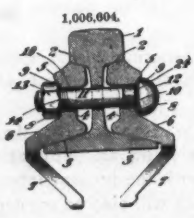
1,006,718—C. F. Busse, Chamois, Mo.

This concrete post form is an improved article of manufacture, namely, a collapsible skeleton for reinforced concrete posts, comprising a number of triangular spacing members adapted to support a central reinforcing bar and reinforcing bars in the triangular extremities of the form.

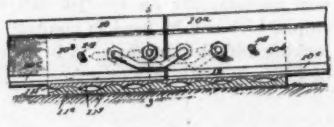
1,006,492.



1,006,604.



1,006,719.



RAILWAY SWITCH.

1,006,717—Earl D. Brown, Kalispell, Mont.

The combination of a main rail having a longitudinally extending tapering bearing seat formed in one side, the rail having its tread cut away to provide a point seat; ties provided with lugs having concaved bearing seats therein; a switch composed of a cylindrical body rotatable in the seats and provided with main and siding point rails adapted to be selectively engaged with the seat in the tread of the main rail; a controlling mechanism rotates the point to two different postions; these positions line up the switch for one or the other route.

RAIL JOINT AND CHAIR.

1,006,719—D. W. Cameron, Pittsburgh, Pa.

A rail joint including the meeting ends of rails, plates engaging against the opposite sides of the rails, and bolts carried through the webs and the plates and having their ends extending oppositely therethrough; the plates are spaced from the sides of the rails, inner clamping nuts are carried upon the bolts against the webs of the rails, and outer clamping nuts are carried upon the bolts against the outer faces of the plates.

RAILWAY TIE.

1,006,695—C. W. Smith, North Baltimore, Md.

A railroad tie, comprising a trough-shaped metallic bar, trough-shaped brackets secured to the flanges of the bar in a relatively inverted position, buffer-blocks resting on the tops of the brackets and projecting above the flanges of the bar, a flat bar arranged above the buffer-blocks, washer-plates for engaging with the track-rails, and bolts passing through holes in the washer-plates, buffer-blocks and brackets.

PROCESS OF PRESERVING HARD WOOD.

1,006,713—A. F. Barry, Kansas City, Mo.

This invention relates to a process of preserving hard wood, consisting in heating the air above the wood being treated within a retort, applying suction at the bottom of the retort to create a vacuum within the retort and to draw the heated air and moisture evaporated from the wood downwardly through the wood gradually and cause sweating of the wood, increasing the suction and vacuum to remove the remaining moisture in the wood, and then introducing hot preserving oil under pressure; compressed air cooled by expansion to a low temperature is then admitted to one end of the retort while allowing the unabsorbed oil to flow very gradually from the bottom of the retort, whereby the cold compressed air in conjunction with the hot oil displaces the hot oil gradually from the wood, thereby contracting the wood and viscidifying the preservative in the sap channels by the cold compressed air.

CLAM SHELL GRAB BUCKET.

1,007,023—A. N. Doud, Cleveland, O.

The combination of a pair of pivotally connected bucket sections, pairs of bail-arms pivoted to the sections at the outer edges thereof, a head shaft to which the bail-arms are pivotally connected at their upper ends, sheaves carried by the bucket sections adjacent their pivotal connections, sheaves mounted on each pair of bail-arms, and a lifting rope passing over the sheaves for closing the bucket sections.

RAILWAY CROSSING.

1,007,024—I. L. Earnheart, Kansas City, Mo.

A railway crossing in which each of the two crossed rails, at the point of intersection, has a transverse groove in its upper side to receive the flanges of wheels running on the other rail, and a flange support, the height and disposition of which is such that as the wheels cross the grooves they will be supported on their flanges, the support at opposite sides of each of the grooves being downwardly inclined from the groove, whereby the weight will be gradually shifted from the treads to the flanges and from the flanges to the treads as the wheels approach and recede respectively from the grooves, the tread portions of the rails alongside of the flange supports being in the same horizontal plane as the remaining tread portions of the rails.

This Journal has a larger circulation than any other, in the Maintenance of Way Departments of the railways of the United States and Canada.

RAILWAY ENGINEERING AND MAINTENANCE OF WAY.

BRIDGES—BUILDINGS—CONTRACTING—SIGNALING—TRACK

New Series, Vol. VII
Old Series, Vol. XXVI

Chicago NOVEMBER, 1911 New York

No. 11

NOV 15 1911

THE MONTHLY OFFICIAL RAILWAY LIST
(The Red List)
IS
THE READ LIST

FRANKLIN MANUFACTURING CO.
WOOL and COTTON WASTE
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For Concrete and Steel Construction—Recognized Standards for Quality and Efficiency. Specification Data and Booklet, "The Protection of Iron and Steel," "The Protection, Decoration, Damp-proofing and Waterproofing of Concrete." Sent gratis upon request.
THE GLIDDEN VARNISH COMPANY, Railway Department, CLEVELAND, OHIO

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SPECIFY OKONITE
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"METALSTEEL" PAINT
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SIGNAL POLES—TANKS
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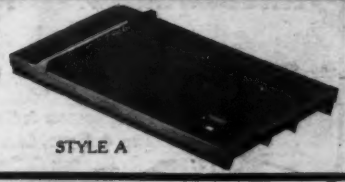
STYLE O

TIE PLATES
THE HART STEEL CO.
ELYRIA, OHIO
PLATES ROLLED BY THE ELYRIA IRON & STEEL CO.


STYLE A

HUBBARD TRACK TOOLS
Are the result of many years experience
"Proved Best by Every Test."
Our track chisels are made from the best crucible tool steel that can be produced for this purpose. Every track tool we make is sold under an absolute guarantee. Our track shovels are standard on many roads. Our locomotive scoops are known to every fireman.
HUBBARD & CO.
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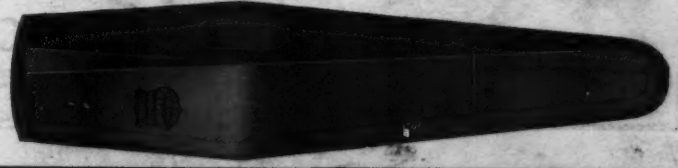

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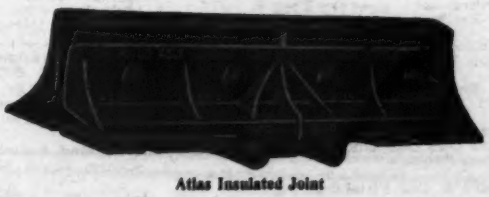

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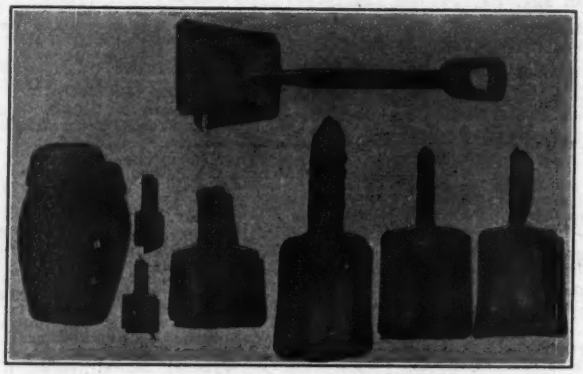

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You know what it is to have a lot of shovels, that ought to be in the hands of your laborers, out being sharpened. You know what it is to put a gang of men on a job and wonder why they don't remove as many cubic yards of dirt as you think they should. It is because the shovels they are using don't hold their sharp edge.

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WYOMING SHOVELS really save their cost because with less men you can get more work.

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Type B for rail up to 80 lbs.	5 inches high	50 Ton Locomotive	3¼ ins.	110
Type A for rail up to 100 lbs.	5½ inches high	80 Ton Locomotive	3½ ins.	145
Type Z for rail up to 100 lbs.	6 inches high	100 Ton Locomotive	3½ ins.	165

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CLEVELAND, OHIO

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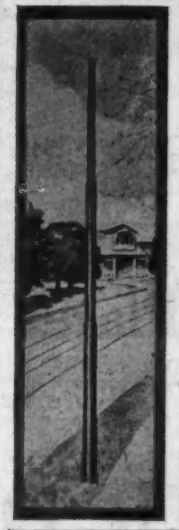

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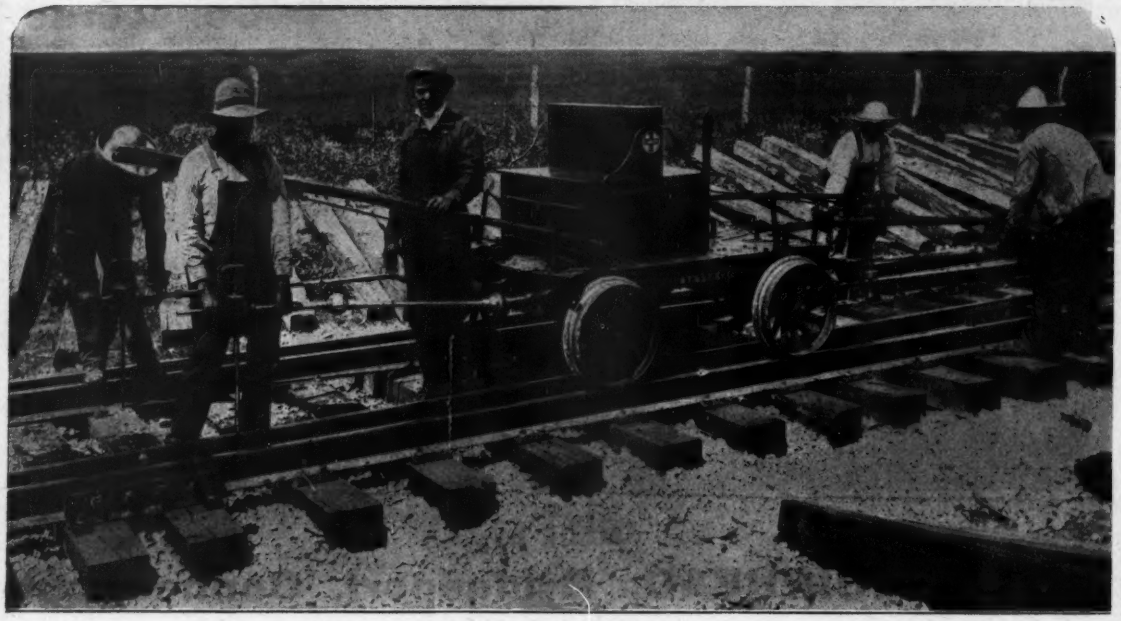

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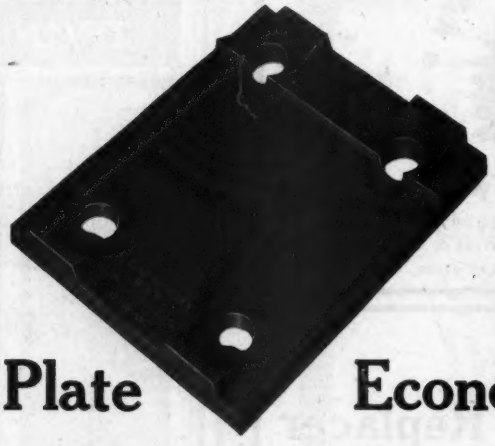
The Machine that Bores the Holes and Drives the Spikes

The Au-Tra-Kar

¶ A Gasoline propelled motor car and the only one that will do the work. The illustration above shows actual working conditions.



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¶ Rolled from open hearth steel. The plate that makes possible the proper application of the Screw Spike.

The Tie Plate Economy 9RW

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The application of dry graphite for lubrication, the use of Dixon's graphite greases, Dixon's Silica-Graphite Paint, crucibles, facings, crayons, etc., is all included in this booklet—a total of 40 pages. There is bound to be some matter to interest you here.

We have tried to make our booklet attractive in appearance as well as interesting to read, and to this end have included views taken of railroad stations and yards, stretches of track, signals, bridges, etc.

Write for copy of this booklet by number 187 R. R.

Joseph Dixon Crucible Co.

Jersey City, N. J.

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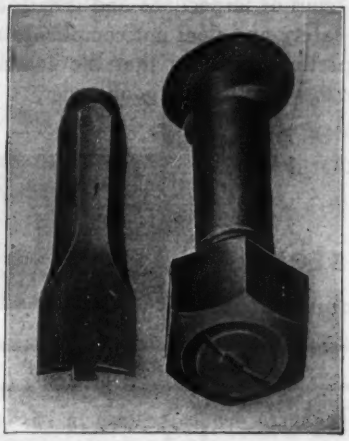

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Absolutely
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FOSTER

Interlocking Switch Stand

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One throw of ONE LEVER operates Switch, Interlock, Signals.

Foster Interlocking Switch Stands have been tested in service and do all that is claimed for them.

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By a demonstration of over sixteen months under both Passenger and heavy Freight traffic

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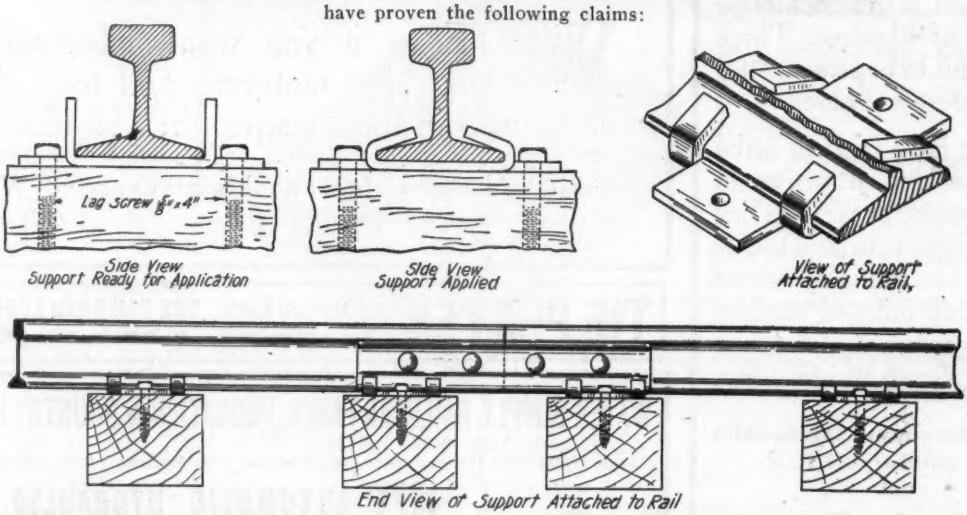

Side View Support Ready for Application

Side View Support Applied

View of Support Attached to Rail.

End View of Support Attached to Rail

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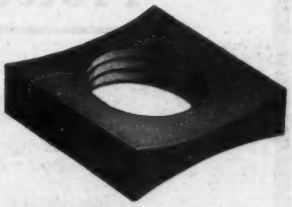
BOSS  NUT

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and other
Turntables

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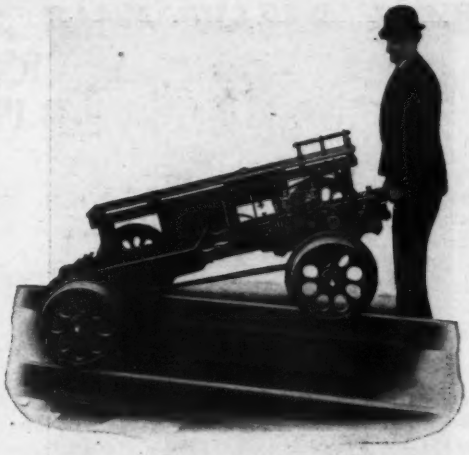

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"The One Man Car"

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Adams Motor Cars are now manufactured and sold exclusively by

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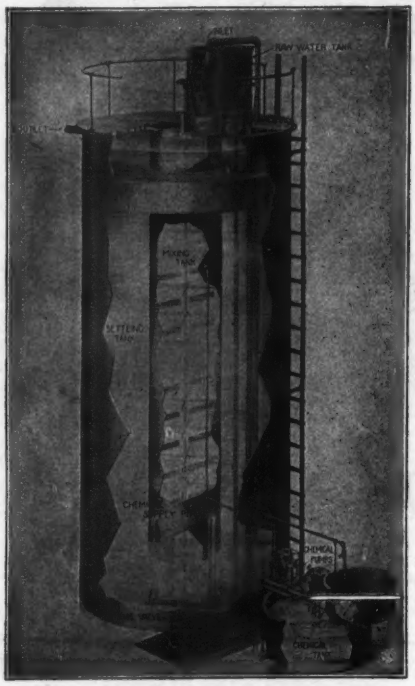

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rendering your signs now in service visible at night. They are operated by the bell battery.

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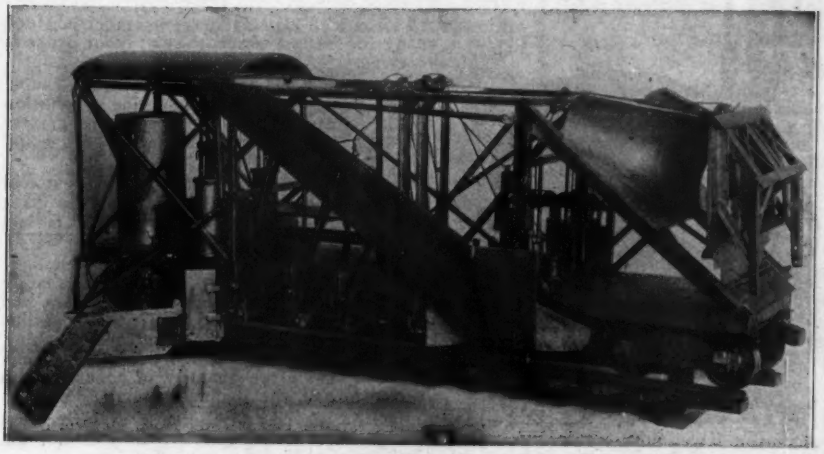

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There are other machines, but they are not competitors with this one in ease of operation, strength, range of work or durability; not a back shop pet, but built for hard knocks.

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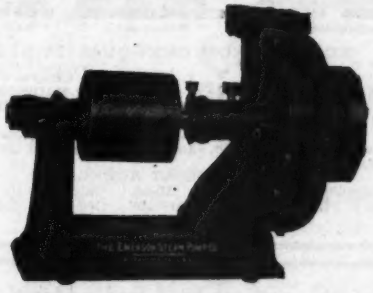

Perfect in design, construction and workmanship. These pumps give a higher efficiency and greater economy than any other pump on the market. Our engineering department is prepared to design pumps to meet special conditions. We invite inquiries from pump users and intending purchasers.

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Stands rougher usage than any other pump. Requires no foundation, no engine, no shafting or belting. Has no trouble-making, breakable parts, such as pistons, plungers, glands or stuffing boxes.

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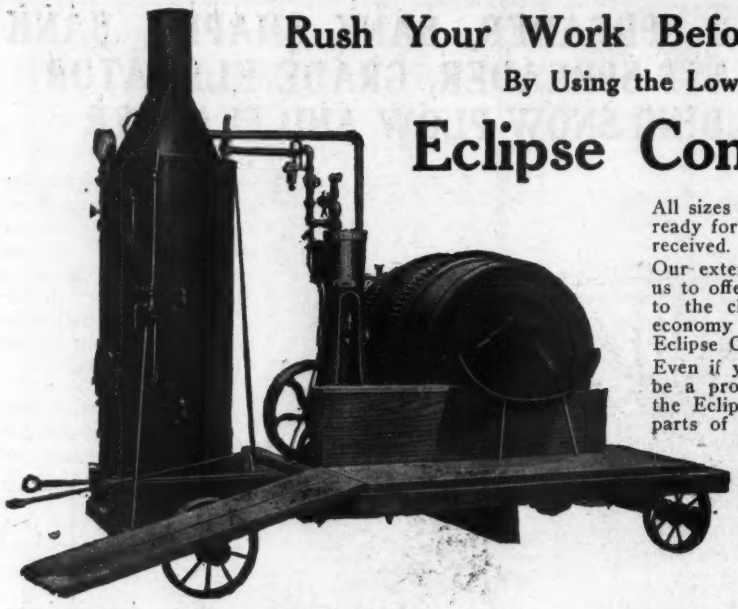
Rush Your Work Before Cold Weather

By Using the Low Charging

Eclipse Concrete Mixer



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Even if you are using other machines it will be a profitable investment for you to have the Eclipse Low Charging Mixer for certain parts of your work.

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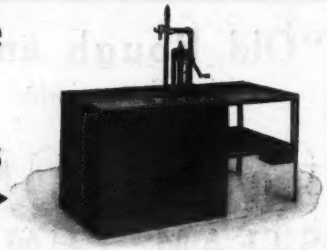
Bowser Table Tank for Way Stations



It just fits the conditions at way stations or oil houses for cleaning and filling signal lamps.

The pump measures the oil into the lamp and the table catches any dirt or spilled oil. The table serves also as an ideal place for trimming and cleaning the lamps.

This is but one unit of the

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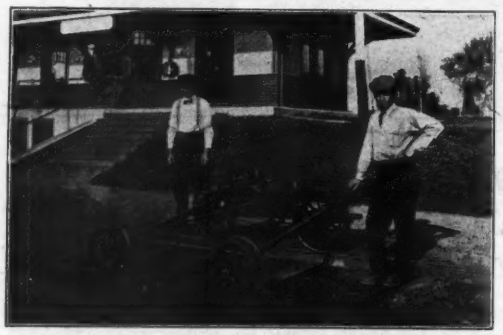

Belle Isle Motors fit any velocipede.

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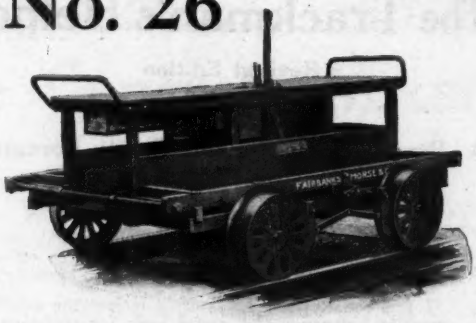

"The Simplicity Car"

Use the above car in your section work and SAVE MONEY.

It is doing this on many railroads.

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Write for Catalog No. 482AQ.

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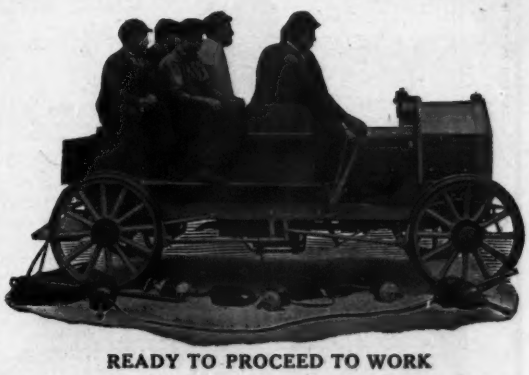
Combined Motor Car and Power Plant



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PERFORMING THE WORK

The Otto Gasoline Electric Tool Car carries laborers to their work at a speed of 10 to 40 miles an hour—makes larger sections of road possible.

At destination the gasoline engine drives an electric generator and furnishes power for all kinds of electric tools such as spike boring and screwing machines, rail drills, rail saws, emery wheels, etc., also supplies electric lights when wanted to clear away wreckage at night. The engine can also drive an air compressor for sand blast work, spraying, riveting, vacuum cleaning, and scores of other jobs.

Tests on screw spike work prove that **one man with OTTO power does the work of Twenty-Five Men by Hand.**

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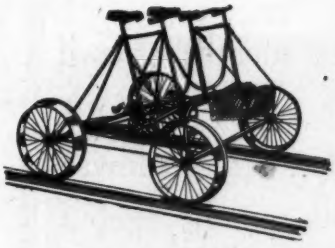
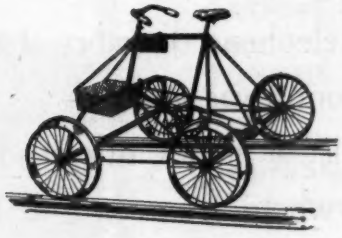
It gives full description.

CHICAGO NEW YORK CINCINNATI OMAHA KANSAS CITY MINNEAPOLIS SEATTLE

HARTLEY & TEETER

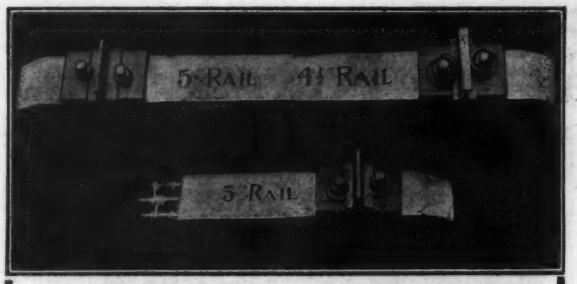




Light Inspection Cars are the Strongest and Lightest running known. The fact that we have not had a single complaint for the past year is proof absolutely that our cars are giving entire satisfaction. We shall be pleased to supply you with our new catalog that tells all about them.

LIGHT INSPECTION CAR CO.

HAGERSTOWN, INDIANA



The above cut illustrates the PERCIVAL CONCRETE TIE AND SPIKING DEVICE, for the exploitation of which the UNIVERSAL CONCRETE TIE COMPANY has just been organized in New Orleans.

The construction of these Ties absolutely prevents anything shaking loose. They secure a track so permanent and reliable as to make no comparison between them and other Ties.

Not a theory, but a practical tie and fastening, as is proven by several years of constant use on various trunk lines.

Note the "V" shaped centers of the base of these Ties—overcomes center binding, so common in all other Ties, and so conducive to spreading tracks.

No cheap wood Ties to periodically change. No steel exposed anywhere to corrode, and for strength and simplicity, this Tie has no equal.

No expensive preserving plants to build and maintain.

They have withstood every test to which subjected, on various trunk lines during five years past.

We stand alone in the Concrete Tie Industry and guarantee our ties. The use to which they have already been subjected demonstrates the fact that with these in the roadbed, rail spreading would be practically impossible.

They can be manufactured by common labor, along the line of the railroads, thus rendering the Companies independent as they will always have a supply of Ties on hand.

Please make remittances for subscriptions to the stock to the Whitney-Central Trust & Savings Bank, New Orleans, who will issue proper receipt for same.

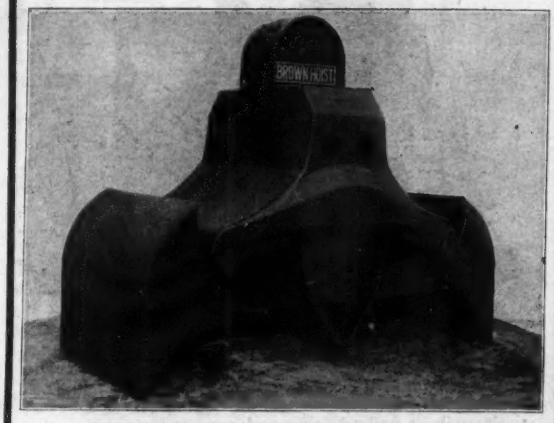
Testimonials, references and full information upon request.

Universal Concrete Tie Company

1408-9 Whitney-Central Building

NEW ORLEANS

"BROWNHOIST"



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The Brown Hoisting Machinery Company

Main Office and Works

CLEVELAND, OHIO

Branch Offices

NEW YORK **PITTSBURG**

WOULD you use an Atlas of three years ago, if one of recent issue was at hand?

¶ Would you use a telephone directory of three months ago, if one for the current month was at hand?

¶ Would you use a list of names, titles and addresses of railway officials published anywhere from one to three months ago, if you had at hand a copy of the Monthly Official Railway List, which is corrected and printed every 30 days?

¶ Neither Does the Railway Official.

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50 Cents Per Copy

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Standard Bucket Type "C" Closed

These

BUCKETS

are the

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Most Durable Buckets Made. Built Entirely of Steel

IN ALL SIZES

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Single Rope Bucket Closed View

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Single Rope Bucket Open View

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We specialize in forms for plain and reinforced concrete pipes.

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Cheap, Durable, Strong

All Sizes

Diameters, 1-5 feet

Length, 2-6 feet

Any thickness of wall

State your requirements and prices on forms and reinforcement promptly furnished.

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Goldie Patented Perfect Railroad Spike

Most practical spike for soft wood ties, having double the adhesion and lateral resistance of the ordinary spike made with chisel point.

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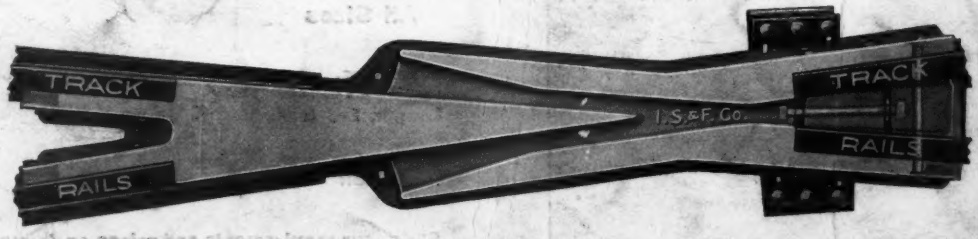
"Indianapolis" R-N-R Manganese Frogs

"A PAIR" OF EACH

The only expenditure necessary for a Frog Crossing.
Use your own connecting rails—Save 10 complete joints.
No open joints—No renewals—No spares.
The Saving in Maintenance alone will pay for them.



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